HEALTH INQUIRY

(HEART DISEASE, CANCER)

HEARINGS

BEFORE THE

COMMITTEE ON INTERSTATE AND FOREIGN COMMERCE HOUSE OF REPRESENTATIVES

EIGHTY-THIRD CONGRESS

FIRST SESSION

ON

THE CAUSES, CONTROL, AND REMEDIES OF THE PRINCIPAL DISEASES OF MANKIND

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PART 1

OCTOBER 1, 2, AND 3, 1953

Printed for the use of the Committee on Interstate and Foreign Commerce

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HEALTH INQUIRY

(Heart Disease)

THURSDAY, OCTOBER 1, 1953

HOUSE OF REPRESENTATIVES,
COMMITTEE ON INTERSTATE AND FOREIGN COMMERCE,
Washington, D. C.

The committee met, pursuant to notice, at 10 a. m., in the committee room, 1334 New House Office Building, the Honorable Charles A. Wolverton (chairman) presiding.

The CHAIRMAN. The committee will come to order.

This morning, the Committee on Interstate and Foreign Commerce begins its inquiry into some important health problems. The hearings which have been scheduled so far cover a great deal of ground. It is appropriate for me, therefore, to outline briefly why we are making this inquiry and what the problems are which we expect to inquire into during these hearings.

Among the diversified legislative functions assigned to this committee, none appears to me more important than the committee's legislative jurisdiction with regard to health. None of the many other subjects with which this committee deals affects every family and individual in these United States more directly than the subject of health. Apart, however, from the human factors involved, I have become convinced from my study of health problems that the subject of health has more important economic implications for our Nation than many of the economic activities which are subject to Federal regulatory legislation. The following figures are evidence of the economic importance of ill health.

Recent surveys show that each day 1¾ million persons out of our civilian population between the ages of 14 to 64, estimated at 98 million, have been disabled from chronic diseases for more than a year. In the case of disabilities lasting 3 months, this figure increases to 2 million persons. The resulting economic loss each year has been estimated at 1 billion man-days.

The major diseases on which we have scheduled our hearings rank foremost among the diseases that cause this tremendous economic loss. Four major diseases alone—heart, cancer, tuberculosis, and rheumatism and arthritis—have resulted in an annual loss of 370 million man-days. This accounts for over one-third of the total man-days lost annually on account of chronic diseases.

The magnitude of the human suffering caused by these diseases and the enormous economic losses suffered both by the Nation as a whole and by individuals and family units raise two important questions:

(1) How can some of the suffering and some of the economic losses be prevented or mitigated; and

(2) How can groups, individuals, and family units protect themselves against the unavoidable economic losses flowing from these diseases?

The first aspect of our inquiry is, therefore, directed primarily toward the public and private efforts that are being made into the causes, treatment, and control of some of these major diseases.

During the second series of our hearings beginning October 13, we will hear from insurance companies, Blue Cross, Blue Shield, cooperatives, employers, and unions with regard to some of the plans now in operation designed to protect individuals and members of groups and family units against the economic hazards of ill health.

Speaking of my own very personal feelings about these problems, I want to say that the thought of possible prolonged serious illness in my own family makes me feel very uneasy. I am confident that others must feel equally vulnerable to the possible impact of extended illness on themselves and their families resulting from extended illness. I am sure others as well as myself are asking the questions: What is being done? What can be done? What can I do?

The people of the United States are today enjoying standards of health as high as those of any Nation in the world. The average life expectancy at birth has risen by 21 years from 47 years in 1900 to 68 years today. During the last 15 years alone, the expected life span of an American at birth was increased by 8 years from 60 years to 68 years.

Credit for these spectacular achievements are due to many factors. However, our tremendous advances in discovering the origin and treatment of important diseases rank foremost among the factor which are responsible for this increase in our life span.

Many diseases that were highly prevalent only a few decades ago no longer present serious medical and economic problems for our Nation. For example, at the beginning of the century, 268 persons out of every million Americans could expect to contact typhoid fever and ultimately to die of this disease. Today, the death rate from this disease is one person out of every million.

Another example is that of influenza and pneumonia. At the turn of the century, 1,844 persons per million died of this cause. Today, this number has been reduced to 313 persons per 1 million inhabitants.

Childhood diseases, such as measles, scarlet fever, whooping cough, and diphtheria no longer present a serious threat to the children of our Nation. The death rate from these diseases has been reduced from 663 per million population at the beginning of the century to 15 per million in 1950. Even more spectacular are the figures with respect to appendicitis, maternal death, and tuberculosis where in 6 short years between 1944 and 1950 the death rate decreased between 50 and 57 percent.

Why, then, many including myself, will ask are we not equally successful with regard to cancer, heart diseases, polio, and the other major diseases that cause such great suffering and such stupendous economic losses? What is responsible for our inability to make similar progress with respect to these diseases? Is it lack of funds? Is it lack of trained personnel? Is it inadequate planning? Is it failure to maintain adequate communications among those active in the field of research? Are there, perhaps, missing in our knowledge of man some basic facts that might be discovered if a concerted effort in that direc-

tion were made? These are some of the questions that occur to me as a layman in this field.

On the other hand, if we have to reconcile ourselves to living in the shadow of many of these major diseases for some time to come, the question that we would like to ask is how we can provide protection against the economic consequences of these diseases.

I could go on for quite some time giving you my thoughts on this subject of health on which I feel very strongly. However, time is short and we have arranged for a large number of witnesses to be heard.

The 15 days of hearings which we have scheduled so far are perhaps the equivalent of some 45 days of hearings while the Congress is in session. Now that the House is in recess, we will not be interrupted through floor calls or through conflicting committee meetings. Furthermore, we expect to hold hearings, mornings, afternoons, and if necessary during the evening. Therefore, we expect to do a great deal more work in 1 day than we would be able to do at times when the House is in session.

Before calling on the witnesses this morning, I want to express my appreciation for the splendid cooperation that we have received on the part of the men and women in the private and public organizations who have given so generously of their time in preparing for this inquiry and who are here today to participate in our hearings. Last but not least, I want to thank the members of this committee who have interrupted important duties in their own districts in order to attend our hearings this morning.

The hearing this morning relates to heart disease.

The committee has set aside today to inquire just where we are, where we are going, and what additional measures must be taken, particularly in the way of research, that will hasten relief from the burden of heart disease.

As husbands and fathers, individuals ourselves, we members of the committee have a deep personal interest, for we have seen heart disease strike among our families and friends.

As members of the committee itself, we are gravely concerned with heart disease because of the staggering number of our people whom it kills or incapacitates and because of our committee's responsibilities in the field of health.

In the matter of especial knowledge of heart disease, we are laymen. But we are keenly conscious of our legislative responsibilities for the Nation's health, and we want to search out the important facts about heart disease.

What is its true significance? What about the gloomy statistics? What is being done today? What is not being done that could be done? What are the prospects, not for the far-off future, but for the immediate years ahead? What are the resources? What has been accomplished in the past few years?

Heart disease is like an enemy loose within our country. It seems timely, when we are attacked by this disease as never before, to present to the American public the facts, to inform them about the current efforts to control heart disease, and to learn what can be done to improve these efforts.

If we can find ways to strengthen the research attack on heart disease, we must do so. If we can curtail the economic losses to

families and to our whole economy, we must do so. If we can take measures to relieve more human suffering than at present, we must do so.

Judging by the response with which the announcement of this inquiry has been received by the agencies, both private and public, most active in the heart field, I am encouraged to believe that much has been done and can be done toward these aims.

This is the purpose of our hearing, and an outstanding group of individuals active in the heart field has come to assist in this inquiry.

The committee has endeavored to provide a plan that will guide our discussion, which I will place in the record at this time for the benefit of those who read the testimony, together with a list of witnesses who are scheduled to appear.

(The matter referred to is as follows:)

HEART DISEASE

AGENDA

1. Purpose of the inquiry: Statement by committee chairman.
2. Where are we today with regard to heart disease compared to several years ago?
   - The significance of heart disease.
   - Rheumatic heart disease: what is is, its importance, what we know today in the way of prevention and treatment, where we stand in research, where we stand in application of knowledge.
   - High blood pressure and hypertensive heart disease: what it is, its importance, what we know today in the way of prevention and treatment, where we stand in research, where we stand in application of knowledge.
   - Hardening of the arteries and arteriosclerotic heart disease: what it is, its importance, what we know today in the way of prevention and treatment, where we stand in research, where we stand in application knowledge.
   - Other types of heart disease.
   - By private or voluntary organizations on the community, State, and funds are being employed in the attack on heart disease? What are the cooperative relationships? How is coordination achieved?
   - By private or voluntary organizations on the community, State, and National levels.
   - By public agencies on the community, State, and National levels.
4. What are the goals, the weak spots, the obstacles to progress, the needs?
   - In research.
   - In the application of knowledge.
5. What are recommendations for strengthening the nationwide attack on heart disease?
   - In research.
   - In research facilities.
   - In research training.
   - In medical education and teaching and training.
   - In community services.
   - In public education.

PARTICIPANTS

Dr. Irving S. Wright, past president, American Heart Association; professor of clinical, medicine, Cornell University Medical School.

Dr. T. Duckett Jones, medical director, Helen Hay Whitney Foundation, New York City.

Dr. Robert W. Wilkins, vice president, American Heart Association.

Dr. E. Cowles Andrus, Johns Hopkins University, president-elect, American Heart Association.

Dr. Edward J. McCormick, Toledo, Ohio; president, American Medical Association.

Dr. James Watt, director, National Heart Institute.
Dr. Robert W. Berliner, chairman, committee of laboratory chiefs, National Heart Institute.
R. O. Betts, executive director, American Heart Association.
Dr. Jean Jones Perdue, member, board of directors, Miami Heart Institute, and practicing physician.

The CHAIRMAN. You gentlemen, and our distinguished lady, have already been supplied with a copy of this guide, so to speak, and we assume that your testimony will have regard to it.

The committee is honored to have with us this morning representatives of the American Heart Association, the National Heart Institute, the American Medical Association, and other outstanding authorities in heart diseases.

Dr. Irving Wright, of the Cornell Medical School, and former president of the American Heart Association, we are honored to have with us this morning. I understand that he and his associates in the American Heart Association and colleagues of the National Heart Institute are prepared to assist the committee in evaluating the problems this disease presents to the American people.

Doctor, I want you to proceed at this point, to take over as it were. In the past the usual procedure of this congressional committee has been for the chairman to call the different witnesses who are to appear. However, for the purpose of these hearings we have adopted a different course. Dr. Wright has been selected by those who are interested in this subject to act, so to speak, as the leader of the discussion. The discussion will, therefore, naturally, take on something of the appearance of a symposium.

We hope in this way to make it extremely informative and informal and to gain the greatest possible amount of information.

We want Dr. Wright to proceed just as he sees fit.

I would suggest that Dr. Wright introduce those who are present and who will testify in the hearing.

For the assistance of the reporter we have asked the different doctors to have their names prominently displayed upon their person so that the reporter may know who is speaking.

I have some doubt, however, as I look at your tagging, about whether it will be possible for him to read their names.

The reporter shakes his head in accordance with the statement I am making. Therefore, I would suggest, as an assistance to him, and in order that the record may be complete, that when a doctor speaks either in answer to a question by Dr. Wright or by anyone else or makes any statement that he preface it with giving his name, and in the first instance when you speak not only give his name, but give his identity with the heart activity and where he is located so that his testimony will take on added significance and importance because of the position that he occupies in this regard.

Now, Dr. Wright, will you please proceed. Before you do so I will ask the members of the committee if they have any comments that they wish to make at this time or suggestions. If not, then, Dr. Wright, will you take over?

Dr. WRIGHT. Thank you, sir.

I wish, first of all, to express the grateful appreciation of the representatives of the American Heart Association, the National Heart Institute, and others who are here to contribute to this symposium

testimony, for your generosity in inviting us and also for the very splendid manner in which you have proposed that we may proceed. I think and hope that we will be able to make a real contribution. I know that the members who are here assembled have come sometimes at some inconvenience because of the great importance of the problem as you have outlined it.

I am going to ask each of them—may they stand when they identify themselves so that everyone can see who they are?

The CHAIRMAN. I think that would be well, and before you proceed may I read a letter which has just come to my attention from Oveta Culp Hobby, who is Secretary of the Department of Health, Education and Welfare, dated September 30:

> DEAR MR. WOLVERTON: Your September 18 letter, informing me of the committee hearings scheduled to begin October 1, and inviting me to send a special representative of my office to attend the hearings, is much appreciated.
>
> The Assistant Secretary of the Department, Mr. Russell Larmon, responsible for legislation and congressional relations, is asking Mr. Donald Counihan, congressional liaison officer, to maintain continuing contact with the committee. In addition, Dr. Chester S. Keefer, Special Assistant to the Secretary for Health and Medical Affairs or his assistant, Mr. M. Allen Pond, plans to attend some of the committee hearings.
>
> If through Mr. Counihan's services or in any other manner we can be helpful to you and the members of your committee and its staff, I hope you will let us know.
>
> Sincerely yours,
>
> OVETA CULP HOBBY, *Secretary.*

That leads me to inquire whether there are other representatives of the departments of government present today who would like to have their names made a part of the record.

I have the names presented to me of the following:

Dr. R. Keith Cannan, Division of Medical Sciences, National Research Council, Washington, D. C.; Dr. Stella L. Deignan, Bio-Sciences Information Exchange, National Research Council, Washington, D. C.; Dr. Philip S. Owen, Division of Medical Sciences, National Research Council, Washington, D. C.; Dr. D. E. Price, Assistant Surgeon General, Public Health Service, Washington, D. C.; Dr. H. Burr Steinbach, Assistant Director for Biological and Medical Sciences, National Science Foundation, Washington, D. C., and Dr. C. J. Van Slyke, Associate Director, National Institutes of Health, Washington, D. C.

Now, if there are any others present than those whose names I have read I will be pleased to have you stand and identify yourself and give your name and position so that it may be made a part of the record.

Very well, Dr. Wright, you may now proceed in your own way.

Dr. WRIGHT. I am going to ask Dr. T. D. Jones to stand first and identify himself.

Dr. JONES. I am Dr. T. Duckett Jones, vice president and medical director of the Helen Hay Whitney Foundation, vice president of the American Heart Association and a member of the advisory committee of the National Heart Institute called the National Advisory Heart Council.

Dr. WRIGHT. Dr. Perdue.

Dr. PERDUE. I am Dr. Jean Jones Perdue, of Miami Beach, Fla., a member of the board of directors of the Miami Heart Institute, a

member of the board of directors of the Miami Heart Association and a practicing physician in Miami Beach, Fla.

Dr. WRIGHT. Dr. Yeager.

Dr. YEAGER. Dr. J. F. Yeager, Chief of the Grants and Training Branch of the National Heart Institute located out at Bethesda, Md.

Dr. WRIGHT. Dr. Berliner.

Dr. BERLINER. Dr. Robert W. Berliner, chairman of the Committee of Laboratory Chiefs of the National Heart Institute.

Dr. WRIGHT. Dr. Robert Wilkins.

Dr. WILKINS. Dr. Robert W. Wilkins, associate professor of medicine, Boston University School of Medicine, director of the cardiovascular research laboratories at the Evans Memorial Hospital, Boston, and vice president of the American Heart Association.

Dr. WRIGHT. Dr. Andrus.

Dr. ANDRUS. Dr. E. Cowles Andrus. I am president-elect of the American Heart Association, associate professor of medicine, Johns Hopkins University, and physician in charge of the adult cardiac clinic at Johns Hopkins Hospital.

Dr. WRIGHT. Dr. Watt.

Dr. WATT. Dr. James Watt, director of the National Heart Institute, Bethesda.

Dr. WRIGHT. These individuals will speak on matters of policy in reference to the organizations which they represent and on matters concerned with research or medical opinions. They will be asked to speak as private individuals.

The CHAIRMAN. I would like to also make mention of the fact that the following members of the committee staff are present:

Dr. Stevenson, Dr. Stockburger, Dr. Borchardt, and our special counsel, Mr. John B. Teeter, executive director of the Damon Runyon Cancer Fund, who has assisted us in bringing together this symposium.

Dr. WRIGHT. Before I proceed I should like to ask whether there are individuals who have been asked to testify who have not identified themselves thus far?

STATEMENT OF DR. IRVING S. WRIGHT, PAST PRESIDENT OF THE AMERICAN HEART ASSOCIATION AND PROFESSOR OF CLINICAL MEDICINE AT THE CORNELL UNIVERSITY MEDICAL SCHOOL

I should first like to make a statement regarding the significance of heart disease as it affects the American people. Perhaps we should preface this by pointing out that heart disease is not a single disease, but it is a term which is commonly used to include many diseases, some of which I will mention.

Of these the three outstanding causes of death and prolonged illness are arteriosclerotic heart disease, hypertensive heart disease, and rheumatic heart disease.

Id addition, howover, there is a long list of other diseases which are capable of affecting the heart and the blood vessels in the body, and we include in this problem all of the blood vessels from the head to the toe, so to speak. These other diseases include problems of congenital defects either of the heart or of the blood vessels, syphilis, diphtheria, viruses, pulmonary diseases which secondarily put strain on the heart and affect the heart, tuberculosis, diabetes, excessive activ-

ity of the thyroid gland, and various types of anemias or tumors which sometimes involve the heart and the blood vessels, various types of endocrine disturbances which secondarily involve the heart and many other diseases, almost too numerous to mention.

We will speak of them in our discussion throughout the day using the term "heart disease" as inclusive.

Now, here are some of the facts which are staggering to the imagination, but nevertheless represent the picture as heart disease affects our country.

In the first place, heart disease is the leading cause of death in the United States. It causes the death of or kills more than 1 out of every 2 persons that die each year in our country.

It is anticipated that in the current year about 785,000 people will die of heart disease.

It is less understood that heart disease is the leading cause of death among children.

It is generally thought of as being a disease which primarily affects the aged and maybe perhaps in some persons' minds is considered inevitable. This is a misconception, although it does affect a very large number of people as they grow older.

It causes about one-sixth of all the deaths in the military ages, that is between 20 and 39.

It causes one-third of all the deaths in the productive years, shall we say, the most productive years between 35 and 54.

It causes half of all the deaths in the ages between 55 and 74, and it causes far more than half of all the deaths after the age of 74.

Now, in terms of manpower about 3½ percent of all the World War II selective-service registrants examined were rejected because of heart disease. That represents figures somewhat as follows:

Three hundred and seventeen thousand five hundred men were rejected as of August 1, 1945, because of heart disease.

About 80,000 men were given disability discharges from military service or died in service because of heart disease in the war years between 1942 and 1945,

It is readily understood that this involved younger men in the so-called prime of their physical life.

Rheumatic fever alone immobilized more than 40,000 men in the Armed Forces during World War II.

Rejections from military service for heart disease were high during the Korean conflict also.

In 1 area in 1 State it was found that 1 out of every 8 men rejected, all under 26 years of age, were turned away because of organic heart disease.

In the Navy alone, in World War II, 4 million man-days were lost because of rheumatic fever and rheumatic heart disease.

The actual or potential manpower contribution—to defense or the Nation's general productiveness of 1 person out of 15 or 16 is limited to some degree because he or she has heart disease.

Approximately 176 million workdays are lost yearly because of heart disease.

At least 653,000 man-years are lost each year in industry alone because of heart-disease disabilities.

It is estimated that in 1951 about $2,124 million was the cost of heart disease in loss of productivity.

Compensation and pension payments to veterans in 1950 because of heart-disease disabilities were $168,250,000.

The proportion of insurance claim payments for deaths from heart disease has been steadily rising. In 1951 a major company paid the beneficiaries on account of heart disease a total of $173,680,000. This is just one company. This sum was about 3½ times the amount paid for the same disease in 1931, showing a very marked increase in the disability cost of these diseases.

At a hospital rate of $12 a day, according to an estimate and example, 1 patient with chronic heart disease costs about $4,300 a year to maintain in a hospital. This would mean that if 50,000 patients—and that is not an excessive number—with heart disease received hospital care for a year, the cost would, in 1 year, equal $219 million for the hospital care of these patients.

Sixteen thousand dollars per case, or a total of $640 million, was the cost of the cases of the 40,000 men inactivated by rheumatic fever alone during the World War period.

Now, this is a small indication of the importance of heart-disease disability: The Bureau of Public Assistance of the Social Security Administration, Department of Health, Education, and Welfare, after a cross-section survey of 13,200 of 93,359 recipients of aid under its program for the permanently and totally disabled in the productive age bracket between 18 and 65 years reported very recently that diseases of the heart were found more frequently than any other group of diseases or impairments.

Cardiovascular disease accounted for the major or secondary impairment in over 42 percent of the recipients, and was the major impairment in 37 percent. Almost 71 percent of the recipients with a disease of the heart were aged 55 or over. Over one-fourth, however, were in the age bracket between 35 and 54.

For about 1 in every 4 of the recipients with heart disease the impairment was of 10 years or more duration. In other words, these diseases are long-term diseases, very frequently at an enormous economic and sociological cost to a community.

Now, I think it is worth while at this point to make a brief statement about what happens to a family; just a reminder as to what may happen to an individual and a family when that individual is stricken with heart disease. By this, I include many diseases of the blood vessels and also what are commonly known as strokes, or disease of the blood vessels of the brain.

For instance, if a man in the productive years of his life with perhaps three children in college, having had a reasonably good earning capacity, is suddenly incapacitated because of one or another of these diseases, it produces in most families a catastrophic situation. The children often have to be taken out of college. The economic stability and social relations of the family are disrupted. The man is lost from his productive years in business, frequently. Instead of being a producer, an earner, and taxpayer, he becomes not infrequently the recipient of aid and support from others, by compulsion. This is reflected in the entire economy of a community or a country when it is realized that approximately 1 million people in this country have suffered from hemiplegia, paralysis from a stroke; and that 10 million people have heart disease.

Fortunately that picture does not hold for a considerable proportion of individuals who have either a heart disease or a stroke. Many of them are able to return to livelihood, but frequently they are markedly handicapped in their productivity.

If it is a child the family activities must from that time on center around this child in an endeavor to restore the child to reasonable health or perhaps arrange for the care of this child throughout its remaining years.

I feel now that it is important to ask some of the gentlemen who have come with me to dilate on some of the problems which relate to more specifically the major diseases; rheumatic heart disease, high blood pressure, and hardening of the arteries or arteriosclerosis. I am, therefore, going to call upon Dr. Duckett Jones to speak on this subject of rheumatic heart disease; what it is; its importance; what we know about it; the way of prevention and treatment; where we are working in the direction of research; and what we need to know in the future.

Unfortunately, time does not permit a very complete dilation on these subjects, but we hope to outline them so that they are challenging and interesting.

Dr. Jones.

STATEMENT OF DR. T. DUCKETT JONES, MEDICAL DIRECTOR, HELEN HAY WHITNEY FOUNDATION, NEW YORK CITY

Dr. JONES. I will try to stick to the agenda items to give more or less a bird's-eye view from my own personal opinion.

Rheumatic heart disease is a common heart abnormality or difficulty which results from the disease rheumatic fever, which is very common, especially in childhood, but may occur at any age. The cause is unknown, although it is very clear to most observers that it closely follows, within 2 or 3 weeks, infection of the upper air tract (the chest, throat, or head), by the so-called hemolytic streptococcus, a common producer of respiratory infection.

In the last 15 or 18 years a tremendous volume of knowledge of considerable importance has been gained through measures which indicate that if you give daily prophylaxis, daily doses of either the so-called sulfa drugs or penicillin, that the number of clinically obvious illnesses of repetitive rheumatic fever—and repetition is one of its chief problems—can be curtailed to a very large extent, probably 85 or 90 percent.

I am very pleased to note that one of the individuals who first gave prophylaxis in the early sulfanilamide days to the early patients is in the audience, Dr. Caroline Bedell Thomas.

A great deal of this information and strengthening of the concept concerning the importance of preventive measures came as the result of studies done during World War II in the Armed Forces. Prior to that we had looked largely at only rheumatic-fever populations, particularly in rheumatic-fever hospitals and institutions and rheumatic-fever clinics.

In addition to that we have learned in the last several years that if the new therapeutic agents—the antibiotics, of which penicillin is a common one—are used in treating a streptococcal sore throat, that

clinically evident rheumatic fever following this infection can be partially reduced. That is very valuable knowledge which came from 1 or 2 of the rheumatic-fever institutions, and was conducted on a very large scale and was strengthened greatly by work in the Warren Air Force Base in Wyoming under Dr. Charles Rammelkamp, working for the Armed Forces Epidemiological Board, Commission on Respiratory Diseases.

We then have some important preventive knowledge, and it seems very likely that there is presently a diminution in the amount of at least clinically evident severe rheumatic fever. I would believe that it looks as though the number of early deaths—which used to be 20 percent within 10 years after one contracted the disease—is being sharply curtailed.

The Heart Association is trying very hard to get these preventive knowledges utilized. There is no known measure as to how effective or on what scale this is being done, but the Heart Association is doing everything in its power to see that clinics and physicians utilize this important knowledge. However, we do not know yet whether these preventive measures will prevent the appearance of most or much of rheumatic heart disease in early adult life, because a great deal of the rheumatic heart disease develops as the result of the so-called silent or unrecognized rheumatic fever.

Important as these preventive measures are—and the fact that I believe we can now do a good deal—we do still have the problem and we do not know nearly all the answers.

I would say that the research which is presently going on, if it is continuously and adequately supported, strongly points to the probability of learning a tremendous lot more about the fundamental tissue changes and chemical interactions that occur in the important connective tissues of our body which are altered in this severe disease problem.

There are many avenues of research which are open to a large number of exceedingly good workers, and I would say that the amount of funds available at the present time are inadequate to assure the necessary continuity and stability which these and new and potentially able scientists need in order to pursue this problem to its most effective end, which would be to learn a great deal more than we presently know about the problem.

Dr. WRIGHT. Thank you, Dr. Jones. Are there any questions at this point?

The CHAIRMAN. Dr. Wright?

Dr. WRIGHT. Yes, Congressman.

The CHAIRMAN. I note the presence of Dr. Scheele, the Surgeon General of the United States Public Health Service. I have invited him to come and sit with the staff. And now, Mr. Dolliver would like to ask a question for the record.

Mr. DOLLIVER. Doctor Jones, I did not quite catch what you said about the progress which had been made in controlling heart disease as a result of rheumatic fever. Would you elaborate on that, or perhaps repeat what you said?

Dr. JONES. I think, sir, at the present time we have no very accurate data on how much rheumatic fever is being prevented with these new knowledges. I think it will take a few years for us to determine that.

But I am sure that the great majority of workers in the field believe that a considerable volume is being prevented at the present time.

However, there is one very difficult feature. In order to treat a streptococcal infection early, and hence probably prevent the rheumatic fever that may succeed it, the streptococcal infection has to be clinically recognizable by the physician. One-third to one-half of such infections are the so-called silent infections and do not cause disease symptoms, and hence there is no possible opportunity for that method to prevent the initial attack in those instances in which it is preceded by a silent infection. On the other side, it should be said that there are many, many cases of streptococcal infection which can be recognized and treated early.

We, however, do not rely on early treatment of streptococcal infections in an individual who has been identified as having had rheumatic fever or rheumatic heart disease. We give them daily prophylaxis, either the sulfa drugs or penicillin, so that they will continually be protected from these types of infection.

I am quite sure that though these knowledges in prevention are of extreme importance and are very helpful, that they are not the full answer that we need. In other words, to take a drug, a preventive drug, continually is quite a difficult problem. It is expensive, also. We yet have not determined how much we are preventing.

I think the problem is still with us, and it has many complexities, but I think that tremendous progress is being made in this area.

That is true, also, in the rehabilitation of adults who have old rheumatic heart disease. Surgical correction of valve deformities at the present time is an important feature in helping some of the adult individuals with crippling heart disease to reassume reasonably active existence.

Dr. WRIGHT. Dr. Andrus wishes to address a question to Dr. Jones.

Dr. ANDRUS. Is it not true, Dr. Jones, that the reported incidence of rheumatic fever is diminishing?

Dr. JONES. I think that is true, Dr. Andrus, but I am not at all certain that the records are very accurate on it, because diagnostically it is extremely difficult. I think all I could say is that it seems definitely to be decreasing. Certainly the number of early deaths, prior to adolescence, seems very much less.

Mr. DOLLIVER. Thank you very much.

Dr. WRIGHT. Any other questions?

Mr. DEROUNIAN. Dr. Jones, would an ordinary cardiograph reveal the existence of a rheumatic heart?

Dr. JONES. If you have a definite rheumatic heart disease cardiographs are usually abnormal, but the heart disease is of such a degree when that happens that you know perfectly well that the individual has a rheumatic heart disease.

As a help in rheumatic fever the temporary changes which occur and which are to some extent shown by electrocardiograms are one of the diagnostic features; and that is being used very extensively, sir.

The CHAIRMAN. Mr. Heselton?

Mr. HESELTON. Doctor, you are with the Helen Hay Whitney Foundation?

Dr. JONES. Yes, sir.

Mr. HESELTON. Is there any connection between that foundation and the American Heart Association?

Dr. JONES. Well, only that the purposes are very mutually connected. The Whitney Foundation is presently directing its attention toward the support of research in rheumatic fever; and the secretary and treasurer of the Helen Hay Whitney Foundation, Mr. Frederick Trask, is, I believe, chairman of the finance committee of the American Heart Association.

And I am in the Heart Association and serve as a vice president. I think there has been a very close cooperation.

In fact, in the Whitney Foundation office for a period of some years now there has been a cooperative effort between the council on rheumatic fever of the Heart Association and the Whitney Foundation to get as accurate data as possible on all those services throughout the country which are being directed toward rheumatic fever individuals. That has been a very close tie.

Mr. HESELTON. You referred to the necessity of adequate contributions in order to maintain continuity of research. Would you care to speak more about that?

Dr. JONES. I think I could speak very briefly.

In 1947 there was approximately $300,000 for rheumatic-fever research from agencies outside of medical schools, and so forth. We never know exactly the total amount. There were about 25 individuals who had established themselves as being able investigators with an interest in this field. There were only 3 men out of the 25 who had any real position or stable job. All of the others were being supported by very short-term grants from agencies outside of the sponsoring institution.

In 1952 the volume of research support had a little more than quadrupled. It was $1.3 million, approximately. The number of able investigators had increased from 25 to somewhere between 50 and 60. You realize that these are evaluations of a scientist's ability, and that is a pretty personal evaluation.

The number of stable positions had increased from 3 to 7. Today we have, with 50 or 60 able research workers of various and very different ages, working mostly in our medical schools and research institutes, only 7 jobs which give them any sense of security or continuity. I think they are all very secure intellectual individuals, but whether they continue to do this work is dependent upon some group of individuals sitting far away from the place where the work is initiated and carried on. That is one of the serious difficulties today with relation to research support.

In addition to that, their running expenses are subject to short-term decisions by individuals outside of their own institutions and their own group; and I would believe that rheumatic fever, like all other areas of research in the health field, very badly needs funds which can be designated for use in such ways as to give assurance of continuity, so long as work is of a very high level of contribution.

In addition to that, a number of places are very badly handicapped through lack of facilities: Laboratories and equipment. That is a very difficult type of money to get. The private agencies can afford to do very little of it.

So far as I am aware in the heart field, the only construction funds of any magnitude or importance were in the 1949 or 1950 fiscal budget for the National Heart Institute, when I think about $6 million was

given, and 22 or 23 institutions were aided to develop more laboratory research space. That has proved an absolute godsend to those institutions, but there are now many that need such facilities, and among them are some of the best rheumatic fever workers in the country.

Dr. WRIGHT. Are there any other questions before we proceed with the question of hypertension?

Mr. MOULDER. Mr. Chairman?

The CHAIRMAN. Mr. Moulder.

Mr. MOULDER. Dr. Wright, you made a statement awhile ago that one out of each two deaths resulted from heart disease. Do you mean all types of deaths?

Dr. WRIGHT. All deaths.

Mr. MOULDER. Not only heart disease, but all deaths?

Dr. WRIGHT. Yes, sir. For example, in New York State 52 percent of the people who died last year died of heart disease, using the definition which I originally gave, in a broad sense.

The CHAIRMAN. Any other questions, gentlemen?

I would like to ask you this, Dr. Jones: Have you any thought to express as to how rheumatic heart disease can be prevented?

Dr. JONES. I did not understand the first part of the question, sir.

The CHAIRMAN. Have you any suggestion to make as to how rheumatic heart disease can be prevented or diminished?

Dr. JONES. I think at the present time the use of prevention methods—particularly the early treatment of streptococcal infections and controlling epidemics of streptococcal infections—is probably the one and only immediate weapon of any importance that we have. I do not think it will be a final answer or a permanent one; but that is what we have now. I think the Heart Association and allied efforts to get that applied is perhaps the most important phase, from a practical point of view, at present, toward preventing or minimizing rheumatic heart disease.

The CHAIRMAN. I have noticed that at times part of the advertising conducted by life-insurance companies is such that they have given advice with respect to certain diseases, which they considered would be helpful to the general public in preventing the particular disease to which the advertisement was directed at the time. Is there anything that can be done to advise or inform the public as to the situations that can create or would be likely to create rheumatic heart disease; and which, by proper advice, could be prevented?

Dr. JONES. Well, I think that now the only preventive knowledge that we have is on these sulfa drugs or the antibiotics; that is, of any great importance.

The life insurance educational programs could certainly help in utilizing that. I think they are entertaining such a program.

Not only that, but I think that the continual attempts to bring these knowledges to the medical profession are important. Last year when the council of rheumatic fever of the Heart Association met, they issued a statement advocating a daily prophylaxis and early treatment of the streptococcal infections with penicillin. That statement appeared in about 12 or 15 of the officials' organs of the professional groups; a great many of them medical; one social service; a hospital association; and so forth.

I think that the Heart Association has as one of its very important responsibilities this type of an educational program. It is mentioned, I believe, in nearly all the annual meetings, the open meetings of the Heart Association, in various parts of the country, which are held for not only physicians but also the lay boards and the general public. So it is beginning to get a very wide range of educational coverage. And I hope that this will help tremendously in an increasing way until our knowledge is better than it is now.

The CHAIRMAN. Frequently we get valuable information as to what has been done and what can be done with respect to certain diseases through the campaigns which are conducted by different organizations for subscriptions to support their work. Aside from that type of information which is given to the public, is there any way, in your opinion, which would suggest a general dissemination of information to the public? If so, whose duty would it be or who could best do that, in your opinion?

Dr. JONES. Well, I think that the American Heart Association, as the one voluntary national health agency interested in this field, has this as a primary obligation, and is trying to fulfill it to the very best of its advantage. One of the most important features of such a program is professional education, because there is no question but that to be effective this must come to the attention of every physician, and he must be urged to use it in his daily taking care of individuals.

I do not know of any appreciable way in which this could be much more effective than it is at the present time, except that I think that it might be concentrated on in a somewhat wider way; particularly with regard to the professional aspects of it.

I think that practically every medical group in the country in the past several years has had it presented to them, and that this is very helpful.

Also, I would believe that the National Heart Institute is very desirous of playing a role in this and that it has been very helpful.

Then there is, for instance, the Heart Bulletin, a magazine which goes to a number of States and every physician in the States through sponsorship of health departments, medical societies, and heart associations. It has had a number of articles on this matter. And I think the constant channeling of information to media of communication such as radio, television, newspapers, and to professional groups, is presently going on at a fairly intensive level.

I think some of the officers of the Heart Association could speak to that. Mr. Betts, the executive director of the Heart Association, is here. He has that as one of his responsibilities. Perhaps he would like to speak to it.

The CHAIRMAN. We will undoubtedly hear later from Mr. Betts. Do you prefer that we have a reply at the present time, Dr. Wright, or when he is on the program subsequently to speak at some length?

Dr. WRIGHT. Well, sir, the American Heart Association has had an active interest in education through leading publications, and in the last year more than 50 of the leading magazine publications of the country have caried extremely informative articles on the problems of heart disease. Many thousands of statements and educational programs have been conducted over radio and television. In order to encourage this the American Heart Association has set up what is

known as the Blakeslee Award for the outstanding accurate informative writing in newspapers, magazines, and so on or in a television or radio production in the media of communication, shall we say of each year, for the purpose of encouraging just exactly what I think you are asking about. We are doing everything we can in our power to see that this is encouraged.

Dr. ANDRUS. Dr. Wright, in anticipation of this question I had a conversation with Mr. Betts, who is beside me here. He tells me that in addition to the large sums which are spent by the State heart associations in public education, 10 cents out of every dollar which comes to the national organization is used to disseminate lay information with regard to heart disease and its control.

The CHAIRMAN. Well, my question originated with the thought as to how much information of a lay character is possible, and how much should be from the standpoint of the physician. I rather gathered from what was said by Dr. Jones that it was very largely a matter which had to be handled through the physician, rather than by public dissemination of information. Is that so; or is there a place in the picture for public dissemination of information?

Dr. ANDRUS. I think there is a very large place for dissemination of well-founded information to the public. As you are aware, sir, physicians have difficulty in expressing themselves in lay terms. With the assistance of good lay writers I think that difficulty is being overcome.

To say the least, the Heart Association and those in the field are awakening to the importance of disseminating information to the public; accurate information and information which will allay fear and provide accurate hope in the future.

The CHAIRMAN. What I had in mind was whether the situation is such that the dissemination of information to the public would materially reduce the number of those suffering with rheumatic heart conditions, or whether it is entirely a matter of treatment after they have it. Is there anything that can be done from a public standpoint in bringing home to them what, if anything, has a tendency to lead to rheumatic conditions, and, therefore, should be avoided? That is a layman's question.

Dr. WRIGHT. Will you answer that, Doctor?

Dr. ANDRUS. I think, as Dr. Jones has pointed out, that insofar as rheumatic fever is a consequence of an infection, the advice to the public to consult their physicians when they have sore throats is a sound means of prevention. I think that the insidious nature of the onset of rheumatic fever in so large a proportion of the incidence, as Dr. Jones has emphasized, would make it difficult for the layman to recognize the need.

Does that answer your question?

Dr. JONES. May I say, sir, in addition, that in some areas of the country—and we hope this will increase more and more—there are movements to develop programs which will help protect the identified rheumatic fever individual. And, in addition to that, efforts on a communitywide basis would help control streptococcal epidemics. For instance, in Youngstown, Ohio, there is a study in which all children with respiratory infections in the schools of Youngstown are seen by a physician and nurse, and cultures are taken to see if they have the streptococcus in their throat. They are promptly treated if

this turns out to be true. This is a very complicated and difficult problem, but cooperation between schools and varied agencies in the community, and private physicians and so forth, unquestionably is probably more important than the individual parent or family, in view of the fact that so much of the streptococcal infection is quiet and does not cause symptoms.

In Newton, Mass., in a demonstration program of the Public Health Service, there was a very beautiful communitywide program conducted with the cooperation of the physicians of that community to see that every known rheumatic got prophylaxis daily, and that streptococcal disease, wherever it appeared in the community, was promptly treated.

I am sure that that will increase, and it is one of the very important efforts which I think will result in a diminution of this health problem.

The CHAIRMAN. What I am interested in, of course, is our particular opportunity for service in the Congress. Is there any definite opinion with respect to what Congress could or should do through public agencies by giving authority to them that they do not have at the present time, or to better utilize what authority they do have? Or, is it, instead of a Federal proposition, a State proposition, or a local proposition? In other words, in what way, if any, by legislation would it be possible for Congress, a State legislature, or a local governing body to be helpful in this particular matter?

Dr. JONES. Well, as the present research pattern in health is organized I think it unequivocally is true that the funds for research which are presently going to the Heart Institute and other institutes of health are very important. I would like to say that in approaching any one of these health problems if you support basic work you may surprisingly find that your research is helpful to a number of disease entities and not necessarily the one you are particularly interested in. That is a very important feature of research support, and it is vitally essential that funds for research not specified to rheumatic fever particularly but to the Heart Institute, and general-grants program of the Public Health Service, be provided. That is one of the most important features in the advance of health knowledge throughout the country.

I would hope, also, that the Heart Association as a voluntary agency would continue to exert its efforts to raise funds for research, because this is of extreme importance to the health of the American people in other areas of heart as well as in rheumatic fever.

I would hope that through both agencies that there could be means ultimately developed whereby we could give greater stability and continuity of assurance of support to outstanding workers.

I think the Public Health Service, National Institutes of Health, has given every evidence that it is interested in that and is accepting its responsibility.

I am not at all certain that there is any legislative need for changing the law to make that possible, but I do think that the level of funds is one way in which it could be helped.

So far as the motion with regard to applied knowledge is concerned, I would say that the local heart associations throughout the country, under the guidance of the national organization, have this as one of their major problems, and that they are doing as much as

it is humanly possible at the present time to do to see that these prophylactic programs get into operation working with medical societies, health departments, and others. I do think that there is one serious threat to effective work in this area, and that is that there apparently has been a reduction in the grants to States for funds, so that the State health departments cannot make plans in these areas in a more effective statewide manner.

So far as I am aware, those are the only two ways in which the progress of application of our present knowledge, along with the educational program which we have discussed, can become increasingly more effective.

The CHAIRMAN. I would not want my question to even indicate the thought that governmental activity either at the Federal, State, or local level should take the place of the voluntary effort which is being made by organizations. I am thinking in terms of cooperation, and supplementing, so to speak, and the assisting of one by the other.

For instance, in the answer that you have just made, you made mention of the fact that very often in conducting research there is some fact ascertained which does not necessarily have direct application to the particular research which is being carried on, and yet is valuable information maybe from some other standpoint.

That leads me to ask a question. Having in mind that we have heart disease, cancer, mental illness, and so forth, and that research on all of which is being conducted, we will say, in a vertical way within their particular confines, should this research in the several fields be coordinated? When research in any one of them ascertains some fact which may be of assistance, not necessarily in the heart field so much as in the cancer field, or whatnot, as it may happen to be, should there not be some coordinating agency which would bring the whole research and its results within into a horizontal attitude? In other words, should it not work across the different types of research for different diseases?

You are interested in the heart diseases and you are right in that. Others are interested in the research on cancer. When you have developed something in heart research which is an advantage in one of these other special research activities, should there not be some agency of Government or otherwise which would coordinate those studies in such a way that what you gain in one, which may not have any application to that particular one, will not be lost as to the one to which it does have a real application and a real purpose and a real use?

Dr. JONES. I think there are two aspects of that. One is that for really great progress we are dependent on great basic or fundamental knowledge, knowledge that is applicable to a broad field. There unquestionably exists a number of blocks to communications between scientists because of the sheer volume of data which is existent today in any one particular area.

I think that scientific publications unquestionably could be improved with regard to the transmission of knowledge across from one interest or barrier to another. It is a difficult subject.

I think there is a fair amount of effort at correlating that and that in our schools, for instance, particularly our medical schools, that is a subject of considerable importance and general interest.

I am not sure that any national agency could more than partially accomplish this because what scientists read is really difficult to control or be sure of and I am sure it should not be controlled.

I do think some effort could be made to do what can be appropriately done toward improving transmission of knowledge.

Now, at the practical level, I am quite certain that anything which comes from the cancer field which would be relevant to heart in an applied way, and vice versa, would be very quickly picked up by individuals or brought to the attention of individuals who are responsible for the application of that knowledge. Well, the physician is primarily, ultimately responsible, but the agencies that are interested I think—both public and private—will unquestionably get that information quite quickly as soon as it is reasonably proved.

I would like to say that though I am interested in one phase of heart disease, I am aware of the fact that great progress comes when a new principle is discovered, although its practical aspect may be far-reaching and can pick different directions from that of any one interest.

For instance, the hormones in the last several years have been applied in several particular areas of health problems, but the probability is that the importance of the steroid hormones will exceed that of the adrenal cortex in its function and capacity as knowledge from its physical capacity to produce various substances is determined. It is thus of far greater importance across the board to human stability and equilibrium, health, and disease, than it is to any one particular disease syndrome.

It is very heartening that, with this tremendous and necessary interest in a particular category, in the past 2 or 3 years as you would go to medical and scientific meetings, you would find that the programs of all had the same thing in them. That is the scientific area which is growing as of the moment and which can be used in a wide variety of things and ways.

I am not at all certain that any very extensive coordination—other than attempts to improve communication, and certainly not to control in any way these features—could be effective. But, that is my personal opinion, and it may be entirely erroneous.

Dr. WRIGHT. Mr. Chairman, with reference to this, I believe there are methods by which a cross-fertilization of minds takes place very well in the medical field today. We have, as Dr. Jones mentioned, many medical meetings—some of which are more or less specialized meetings and others which are of a very broad character—so that the various specialists get together with the men who are working in other fields.

It is rare that a new finding of any importance is in existence today more than a few months before it is presented before one of these meetings and then soon published. So, there is not too great a lag between use in one field by trained scientists and use in another field by trained scientists. The biggest lag is in the length of time necessary to establish the absolute validity of application of those findings to general medicine.

It is ill-advised to utilize these new findings widely until they are all of an established value. Yet, it may take from 1 to 3 years to prove this point.

Therefore, we feel it is very important for doctors to attend meetings because this is where the very essence of what you have requested is accomplished most rapidly.

I should like, if we have your permission, to have Dr. Wilkins present his material on hypertension and Dr. Andrus to present his material on arteriosclerosis, because many of these problems are of a broad nature and apply to all fields of research.

The CHAIRMAN. We shall certainly be glad to hear that, and it may be that the questioning of Dr. Jones has been longer and more in detail than will be necessary as the other witnesses proceed. We are trying to establish a basis, if possible, for increased activity from a Federal, State, and legislative standpoint and we are sort of groping here and seeking information and hoping that out of it all there will come something that will be helpful and improve the situation.

It is gratifying to hear yourself and Dr. Jones state that there is this disposition to pass on from one to the other the information that becomes available as a result of a particular research which has been made and which may have a greater application to some other subject of research.

In that connection, I am wondering whether with the establishments which we have now in the Federal Government there is a place for them in this picture to participate in the way of cooperating in making certain that these developments and this research information which comes from different research programs is available and is usable by other research workers.

Of course, we have the Public Health Service through its National Institutes of Health and other Government agencies covering many of these diseases, such as the National Science Foundation that is interested in basic, fundamental science. We hope that as time goes on, such information will become generally available.

In other words, we have these Federal agencies in existence and it was my thought that they might be helpful and if so, in what way? That is what I really had in my mind, to find out whether first there was a necessity and second whether there is a way that we can improve the situation even beyond the manner which you have set forth as already being done.

Dr. WRIGHT. We have discussed this to some degree. I think it is fair to state that we feel that for the present the framework is there, but perhaps they have not had the opportunity to develop the possibilities to the fullest degree as might be done in the future.

In other words, the National Institutes of Health have really just begun to function in a major way in terms of long-term planning and they need—I am sure—more help to implement their programs. Perhaps, if that type of support were forthcoming we could develop a long-range production for this type work. Does that answer your question? The point is that it is doubtful whether a new—and an entirely different program—is necessary in terms of introduction. We now have a framework that is set up that is not fully functioning to capacity as yet and it may take a few years to evaluate its ultimate achievements.

The CHAIRMAN. I am not speaking from the standpoint of new organizations. I would not be very optimistic as to the creation of new agencies, but I do have in mind that we do have organizations of a general character such as the National Science Foundation whose

whole purpose has been to be a sort of coordinating agency as well as an instrument to bring about an increasing interest in basic science.

I am hopeful that maybe there is something which you had that could be utilized to an advantage, but let us have in mind—and I am speaking informally—let us have in mind as we go on with these hearings on the heart today, and the next day cancer, and so forth and so on—let us keep in mind the objective. The objective is to improve the conditions that exist at the present time either by prevention or otherwise or by research. Let us keep our thoughts entirely on the point as to whether there is something that we can do.

You people through your activities and your interest and by your experience have learned what could be done or what would be helpful. That is the thing I am anxious for this committee to head up if possible as a result of these hearings.

Dr. JONES. Mr. Chairman, could I add one thought about that?

The CHAIRMAN. Yes, sir.

Dr. JONES. I am quite certain that in the minds of most of us here that the question of basic research is ever present and it is the means by which our greatest and most significant advances come.

The National Science Foundation, in all of its statements that I have seen, has unequivocally shown a tremendous interest in basic fundamental research in broad scientific areas, and I would certainly hope that the Congress in its wisdom will see fit to give them adequate funds so that they can do it.

The Public Health Service from a health point of view is also interested in basic medical research and I hope that there is no competitive pattern or that one ever develops. I am sure that both of those agencies could, if they are given the opportunity, do a great deal of stimulating and crossfertilization of ideas, because just as work in one particular vertical health problem may result in advantages which are helpful to others, just so is work in the natural sciences—chemistry, physics, biology, and so forth—of great importance and pertinence to methods used in health knowledge. Their information devices can be of tremendous mutual help.

However, there is one great disseminating lack in our total situation now, and I hesitate to mention it because I do not think basic research from a scientific point of view is adequately being supported today in relation to what its opportunities are and what its needs are.

In the late twenties Fleming in England made some very direct simple observations on penicillin and its ability to have a freer bacterial growth. Those observations were recorded scientifically but they lay fallow for a good many years until Dr. Florey at Oxford became impressed with them. He became impressed with their practical importance and then he and his coworker did a very extensive repetitious study and advanced the work from the point of view of its ultimate practicability. That resulted in the beginning of the large volume of developing culture work which resulted in first penicillin and naturally most of our other presently important antibiotics, once it had been opened up. I have not the remotest idea what the cost of that development work was. It certainly was in the nature of a great many millions of dollars and that was done largely through Government support because of its pertinence to our war effort, and through Office of Scientific Research and Development. At any rate, it would have

been of such magnitude as to have made just the straight private-enterprise development all but impossible at a rate which we saw happen.

There is presently no government or private venture so far as I am aware in those areas that presently are importantly relevant to our emergent situation that can take basic knowledge once it is acquired and expend the tremendously greater funds that are necessary for developmental measures and studies.

I think on that score that the atom bomb is perhaps the most magnificent example, because the nuclear physics knowledges which came, came over a long period of years from basic scientists primarily in Europe and from some in this country; this is irrespective of whether it should or should not have been developed, because that is not my prerogative to discuss here. But the cost of the initial bomb was a tremendous amount of money, and I know of several very important areas now in which work of a very exciting nature is going on in which large developmental funds are needed. Those funds are just not available from any ordinary source, and I would wish that the committee could help in this.

But I would hope that this would be done only with the understanding that basic science does itself need further support.

The main question is whether or not some such concepts, medical developmental measures, might not be pursued because I think they could help in bringing to the health of the people a number of measures of a good deal of importance.

The CHAIRMAN. I will conclude my questioning, because it may be that some other members of the committee would like to question you further, by asking this question to either you or Dr. Wright or anyone else present:

Would you say, Doctor, that, if there are any outstanding advances with reference to disease, the scientific and medical publications and the men themselves responsible for them will disseminate that information or knowledge to the public? In other words, is there or could there or should there be or would there be any holding back of the truth, so to speak?

Dr. JONES. I am not aware of any holding back. I think that the scientist himself would speak directly to the public and I am certain that, through presentations at his scientific associations and with the present agencies that are interested, such information if it is very important would probably very soon appear.

Sometimes the New York Times has scientific data far ahead of its publication in any medical journal.

The CHAIRMAN. Thank you, Doctor.

Are there any other members of the committee who would like to ask any questions at this time?

If not, we will proceed with your next witness, Dr. Wright.

Dr. WRIGHT. Thank you, sir. I am going to ask Dr. Robert Wilkins, of Boston, to speak on the problems that have to do with high blood pressure and hypertensive heart disease.

The CHAIRMAN. That is a very appropriate matter to Members of Congress.

STATEMENT OF DR. ROBERT W. WILKINS, VICE PRESIDENT, AMERICAN HEART ASSOCIATION, MASSACHUSETTS MEMORIAL HOSPITAL, BOSTON, MASS.

Dr. WILKINS. Mr. Chairman, I was very much interested in your introductory remarks about the change that is taking place in the life expectancy of our population, particularly with reference to infectious diseases.

I think most of us were rather startled and perhaps disappointed in Dr. Wright's presentation because those statistics might seem to indicate a poor record in the field that we represent. If anything, the cited figures imply that all aspects of the heart disease problem are on the increase.

You are asking here, in essence, what are the reasons that we are not making progress if we are not and where do we stand in some of these matters. I think the next two subjects that we are going to discuss—hypertension or high blood pressure and arteriosclerosis or hardening of the arteries—are different diseases and different types of diseases from the kinds that you mentioned in your introduction, such as pneumonia, influenza, typhoid, or even the kind that Dr. Jones has talked about. Dr. Jones' interest in rheumatic fever serves to bridge the gap between these infectious or more or less acute infectious diseases and these chronic or what sometimes are called degenerative diseases such as high blood pressure and hardening of the arteries.

The fact is that these diseases—taking high blood pressure as an example—run an average course of 20 years. I think it is necessary to point out that this is different from pneumonia which lasts a week. There you either get well or you do not get well, but it is not a chronic problem of the other sort.

Secondly, we have no information whatever to indicate that high blood pressure has anything to do with infection except where that infection has involved the kidney. This brings us to the question of what do we know about high blood pressure and what is high blood pressure?

High blood pressure simply means a high pressure in the arteries of the body—from those big vessels that lead out of the heart to those, progressively smaller, that reach all parts of the body—all carrying blood. There is always some pressure in them. There is the normal pressure. There is the pressure which can be too high.

I think you could liken it in some ways to a hot-water circulating heating system in your home, where the pump in the cellar pumps the hot water from the furnace up to your radiators and then returns it again to be reheated.

If for some reason the valves to the radiators should be shut down part way, increasing the resistance to the flow of water from the pump, then either the flow of water would decrease or the pressure would have to rise. If you did not want to get a lesser amount of heat in your house, you would have to put more juice into your pump and make it pump harder to get the same amount of heat from the water. The pressure in the system would put a strain on at least two points in the system: the pipes and the pump. In a similar way in high blood pressure, when the pressure rises in the arteries, it places a strain on the arteries which are the pipes and on the pump which is the heart

and we have, therefore, the definition "hypertensive or high blood pressure heart disease."

It is well to bear in mind, as Dr. Wright said in his remarks, that we are interested not only in the heart but also in the blood vessels themselves, and we speak of this system as the heart-blood vessel system.

What do we know about what causes pressure to get high in the arteries of the body? In a general way we can say it is, from the standpoint of physics, the same as it appears in the hot-water circulating example that I gave you a moment ago. For some reason the valves all over the body controlling the flow of blood to the body and the flow of blood to the arteries will shut down, making it necessary either for the pressure to rise or the flow to go down. Now, since the body, like the man in a house, does not wish to have a lesser flow of blood, it responds by raising the pressure in these valves. Well, you say, "That is fine, but what causes the little valves to shut down over the body?'" Then, we have to say in most instances that we do not know.

There are some forms of high blood pressure the cause of which we do know, and these forms and their number of cases are relatively small. If you have one of them, it is very important to you because in those cases where we know the cause of high blood pressure frequently that can be removed and the patient is cured. But, proportionately or percentally those represent a small part of the problem—let us say 10 percent or less—and all the rest of the high blood pressure cases can be grouped into what we call essential high blood pressure. One of my patients asked me, "What do you mean by essential high blood pressure?" And I replied, "Well, that means we know essentially nothing about it." And, that is true.

We do not really know the cause of this most common form of high blood pressure. It is barely possible that we may never know it because of the nature of this type of high blood pressure. We have a bridge in the gap of our knowledge, however, coming across as I mentioned before from infectious diseases of the kidney where we can see that if you have an infection involving or secondarily involving, the kidney, you may have, and frequently do have, high blood pressure following. It may be a streptococcal infection like Dr. Jones mentioned in the throat, which seems to be a strain on the kidney and damages it, or it may be a local infection in the kidney such as pyelitis as it is frequently called. After those infections, the blood pressure may rise and if you can identify this as the cause and if there is only one kidney involved—and there usually are not both kidneys involved—you may cure the hypertension by taking out the involved kidney surgically, but such instances of cure as I have indicated are not getting at the core of the problem.

Now, what about all the rest of the essential high blood pressure cases? Is the kidney involved there? Well, if you mean from the standpoint of cause, we doubt it. If you mean "by effect," yes, because the kidney is a mass of blood vessels.

As I mentioned, the blood vessels get involved in high blood pressure because the pressure is too high in the blood vessel so that sooner or later in a high blood pressure case the kidney may become affected and we have what we frequently have in medicine—what we call—a

vicious circle where the original cause—whatever that may be—so affects some other part of the body that it exaggerates the disease itself and it gets going around in a circle, as it were, so that the kidney is involved and that is one of the things that we can more or less hang onto.

Certainly we know that somehow the aims and the personality and the nervous makeup of individuals is important in patients with high blood pressure. It is difficult to bring it down to a specific, generally agreed pattern of personality, but in broad terms one can paint the high blood pressure person more or less as he has been painted as a busy, hard-driving, efficient, executive type of person who gets things done. He drives himself and everyone, and his blood pressure to boot.

The other thing we know about the causes of high blood pressure in this big group is somehow familial, possibly heredity is mixed up with it. It tends to run in families. We will not get into the question of heredity versus environment and those aspects of families, but it does tend to run in families. Now, we can have a great many other factors, but they are the things that we can be very sure about.

You might say, "All right, what can you do about this in terms of treatment and what has been done?"

It is presently hard to change a person's personality. It has been attempted and some successful reports have come out dealing with this approach through the psychiatric approach to treatment.

Then you can say, "Well, you cannot do much about your family." That is true, so approach to high blood pressure from the family point of view does not help us a great deal in treatment. It may help, yes, in diagnosis; it may help us in treating from the psychiatric point of view in which the emotions are of much importance.

Then, we have the kidney diseases which I have already mentioned.

So, when we come down to what can be done about lowering blood pressure we have to confess that as to the causes or even the associated events preceding associated factors, we do not approach it very successfully from that angle.

Then, we get into the field of what we know and what we call nonspecific means of lowering the blood pressure. In this regard there are two main ways in which this has been attempted. One is by surgically removing that part of the automatic nervous system which controls the little blood vessels—the size of the valves if you will. The second is by the use of drugs which resemble these surgical procedures in their effects on the blood pressure.

Now, where are we in this type of approach? I think it is fair to say that in the past 5 years we have made greater advances, pointing with drugs at least, toward a hopeful attitude in treatment, than in all the previous time that we have known about this disease.

Surgery is presently well established as a fairly effective means. The difficulty is that the surgery involved is largely usually done in 2 steps, meaning 2 major operations; and it does not always work. It is virtually impossible to predict in advance on which patients it will work. So, you have to take a chance, so to speak, with surgery, but you will probably do better, if your case is suitable for surgery, than if you do not take the chance, at least if we can believe the statistics that have been published.

Where do we stand in application of what we know that will aid high blood pressure? As has been said by Dr. Wright and Dr. Jones

the avenues for dissemination of knowledge are established. What we need perhaps are a few traffic cops speeding up the flow of traffic, the flow of information, expediting it. I do not think we need to establish new avenues; I think if we would put some one-way streets so that the information flow would be a little more rapid, it would be sufficient. What we already have is sufficient.

Thank you.

The CHAIRMAN. Are there any questions from members of the committee

Mr. CARLYLE. Yes, I would like to ask a question.

Doctor, what is the connection, if any, between poor circulation or insufficient circulation of blood and high blood pressure?

Dr. WILKENS. There is a connection and I am sure Dr. Andrus, who is going to talk about hardening of the arteries and the insufficient or poor circulation to certain parts of the body, will explain those matters. But where does high blood pressure get into this? In high blood pressure as a rule you do not have poor circulation because you have high blood pressure. You would have if you did not have the pressure to overcome the resistance that is there. Now, there is one difference between pure high blood pressure and the arteriosclerosis part of it which can occur with high blood pressure and that is this: The type of resistance in the arteries in high blood pressure, at least in its beginning, is not structural; it is in terms of a muscular contraction. We call it functional. The vessel conceivably could relax, but it is spastic and it is contracted down so that in effect it is putting resistance against the flow of blood. The heart and the whole body responds with an elevation of blood pressure and the blood is pushed on through this resistance anyway. Our treatment of such patients as I tried to describe is to relax the blood pressure and lower the pressure and maintain good circulation.

Mr. CARLYLE. That answers my question.

Mr. HESELTON. Doctor, during your presentation you mentioned the flow of information throughout the medical profession. I would like to ask the question as to how much medical and scientific journals do and whether they are in difficulty financially.

Dr. WILKINS. Well, at the moment, I think most medical journals are doing fairly well financially. I can, personally, well recall a few years back when they were all in dire straits and of course that fluctuates markedly, as you are aware, with the economic conditions of the country. The flow of information through medical journals I think is adequate; it is certainly more than I can keep up with even in my own field. You have journals coming out every day, and this matter of dissemination of knowledge is like leading a horse to water; you know you cannot make him drink, and you can have the stuff there for the doctor, or the public, or both, to read, but can you make them read it? That brings up the manner in which it is presented, and I think it is conceivable that it could be streamlined and so on. But, there the doctor always shies away a little bit, because you get, or tend to get, half information or misinformation across not only to the public but to the medical profession. I think most of us think that a little knowledge is a dangerous thing many times. We would rather keep it in the confines of the really scientific journals where the editorial staffs are very sensitive to having a very high order of reporting, if you

will, and having it complete and accurate. So, you have a sort of vacillation on the part of most of us here as to whether a great effort should be made to open up new avenues of dissemination of knowledge. I think most of us are agreed that the journals which we now have are pretty good, but maybe they could be used better.

Mr. HESELTON. What is the situation with reference to the encouragement of sponsoring meetings either here in this country or internationally where the experts and research people can exchange their information and present their papers?

Dr. WILKINS. Well, I am sure that the personal approach—it works in medicine as it does anywhere else—that is why we are having this meeting together today, so we might know everyone on a personal basis, I assume. To my way of thinking, perhaps, the most important way we have of disseminating information is through the personal meetings at scientific gatherings of people who are doing the work and who have a personal interest in it, let us say. I think there might be ways of promoting the attendance at meetings, particularly by younger individuals doing research work and going into the research field. Now, there you will get back to economics and the question as to why young men do not go to meetings. That is essentially because they do not have the money to go. So, in many research grants now, and this has been recognized by such agencies as the American Heart Association and the National Heart Institute, provision is made for travel expense of this purpose. It ought to also be said that the personnel of these agencies should have adequate funds to attend scientific meetings so that they can carry across this cross-fertilization of ideas from one scientific discipline or field to another. Perhaps in that way some people are at present not having opportunity and more could be assigned to that particular job if the money was available to attend meetings to find out what is going on across the board and to disseminate it. But, that costs money and money must be appropriated or given by public and private agencies to promote that.

If I were going to say where it is most needed, I would say by the younger lower-income group in the field who may want to go very badly but cannot afford to do so.

Dr. WRIGHT. May I make a comment with reference to that?

The CHAIRMAN. Yes.

Dr. WRIGHT. It is my understanding that recently, through an order, the amount of money made available to the public-health group has been decreased markedly in terms of allotments for travel to meetings. I should like to make a personal plea that that matter be rectified because it seems to me if we are going to hope for real cross-fertilization of the mind and further development of our Heart Institute as well as the other public health institutions, it is absolutely important for the men working in those institutions to have the money to attend the scientific meetings without stint. This is one of the most important ways in which they can bring knowledge back to the public-health institution and, in turn, have it disseminated to the States and at other national meetings. They can act as a medium of exchange, but this move seems to me to be jeopardizing the very thing you are trying to bring out in your question.

The CHAIRMAN. Mr. Derounian has a question.

Mr. DEROUNIAN. Dr. Wilkins, would you say that the tendency to hypertension might be hereditary?

Dr. WILKINS. Yes, that certainly very well may be. One of the authorities on that subject is Dr. Thomas, who is in the room, and she has been mentioned before, but she has been studying this problem at Johns Hopkins, and also Dr. Ammond has been studying it for a longer period at Baltimore. Dr. Platt has been studying it in England. I think I am not misquoting them to say that they are in essential agreement that hypertension tends to run in families. If both parents have hypertension, the children are much more apt to get it than if one parent has hypertension. Dr. Platt and Dr. Ammond at least agree that this trait—I will let Dr. Thomas speak for herself on whether it is a dominant one or not—but I think that all agree there is a factor which presumably is hereditary.

Now, the reason that you probably asked that question is that you are perfectly aware of the fact if you are raised in the environment of a family, you will pick up environmental traits from the family. Where the parents are nervous, apprehensive, irritable, and so on, the child may pick those traits up. So, we use the term "familial" to include that concept. But, getting back to your particular question, I believe the best evidence is that it is probably hereditary.

Mr. DEROUNIAN. Dr. Wilkins, do you recommend in the treatment of hypertension the surgical aspect, or does not the diet of the person help to lower the blood pressure?

Dr. WILKINS. Yes, it certainly does and that would be included in medical treatment and frequently is.

Mr. DEROUNIAN. I notice that most of you heart specialists here are quite thin people.

Dr. WILKINS. Yes, sir. Overweight, of course, is definitely an aggravating factor in hypertension, not only because it may make the blood pressure high, but because it places more strain on an already strained system.

Mr. DOLLIVER. Will the gentleman yield at that point?

Mr. DEROUNIAN. Yes, I will yield.

Mr. DOLLIVER. Doctor, would you make comment upon the rice diet that we heard about several years ago?

Dr. WILKINS. The rice diet is a form of a low-sodium diet. Its content of salt is very low.

Dr. WRIGHT. Sodium being salt.

Dr. WILKINS. Sodium chloride is ordinary table salt and the sodium part of that substance is what is important, and that is very low in the rice diet.

Now, there was a great controversy that raged at meetings and in medical circles for several years about whether the low-sodium diet—rice diet—or any other form of low-sodium diet would be effective in lowering blood pressure. I think it is generally agreed now by most of us in this field that it is an effective way of lowering blood pressure, with one hooker; it is awfully hard to keep, especially for a long period of time. If you have a 20-year disease, then you must have at least a 10- or 15-year acceptable form of treatment, and there is the hooker. Any form of dietary treatment as rigorous as a rice or strictly low-sodium diet—and it must be extremely strict in order to be effective—is very hard to keep. I hope that answers your question.

Mr. DEROUNIAN. Do you think, Doctor, in the heart-disease field as well as in all the other serious disease fields, sufficient stress has been placed to educate children in the public schools as to the rudiments of the disease so that they will grow up with these things in mind and try to take care of themselves as they go? I do not know how practical that might be but it seems to me if you trained a child as to what he should watch for in these diseases—assuming he does not get a complex and become a hypochondriac—he certainly ought to be able to take care of himself to a greater extent than without knowing about it.

Dr. WILKINS. You have practically answered the question yourself. You have touched on the danger point and one that the Heart Association is particularly sensitive to, and that is the fear aspect or the hypochondriacal tendency of people who get centered on their own health, which may be a disease itself. I think something could be done educationalwise along this line whether at the school-child age—that is below college age—or not. I would have considerable reservation to make except on very general health rules and on a hopeful positive-approach basis. The name "heart" and "heart disease" is enough in the daily papers to put the fear of the Lord into anybody who knows the meaning of it, and children are not insusceptible to this. I have three children myself, so I know how they respond to this. Children know enough I think right now about the fear aspect of heart disease. If your educational program could turn that around and build it up on a positive basis it might be worthwhile. I am not enough of an expert in child education to speak any further on that point.

Mr. DEROUNIAN. Thank you very much.

Mr. CARLYLE. Doctor, are we as far advanced in this country in producing medicine that is used to reduce high blood pressure as some of the other countries of the world?

Dr. WILKINS. I think we are, sir. I think that the lines of communication between this country and foreign countries have improved very, very strikingly in the past 5 to 10 years. I doubt myself if anything is known about drug treatment, speaking about that one point of high blood pressure, that we do not know about very soon.

Mr. CARLYLE. I gained the impression that a drug was being imported into this country from some country in Europe that was used quite extensively now in tablet form and by way of injection to reduce high blood pressure. Do you know anything about that?

Dr. WILKINS. That is correct, Mr. Carlyle, but the very fact that we can get the drug in quantity, and I think we have it, is significant. As a matter of fact, the drug to which you have reference, I believe, was first used clinically in this country, not in the country in which it was developed, for the treatment of high blood pressure.

Now, chemically it was developed in a foreign country, but I think that our clinicians were pretty quick on the uptake.

Mr. CARLYLE. Is it a new drug?

Dr. WILKINS. Yes, it is a relatively new drug. It was developed in 1944, but as Dr. Jones brought out, penicillin was developed 20 years before it was adequately used.

Mr. CARLYLE. After it has been used and the blood pressure has been reduced is it then that the rice diet is used?

Dr. WILKINS. I did not get the latter part of your question, Mr. Carlyle.

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Mr. CARLYLE. I say after this drug has been used and the blood pressure has been reduced, then the rice diet is used?

Dr. WILKINS. No; I do not think so. That would depend on the patient and on the doctor who was immediately managing the case. After all, the patient and the doctor must cooperate in this. I have had many patients who have refused to take any sort of dietary treatment. Therefore, there is the question of whether it is practical or not practical to put into effect any sort of diet. Therefore, say that the kidneys had been affected by high blood pressure, one could not put those persons on a low sodium diet.

Dr. WRIGHT. By way of dissemination of the knowledge and experience in the field of cardiovascular diseases it may be of interest to the members of the committee to know that in the last year the Inter-American Congress was held in Buenos Aires, which 700 leading cardiologists from all over the Western Hemisphere attended. A week later one was held in London, England, at which members of the Pan-European Congress met.

Next year in this city of Washington we will have a meeting of the International Congress with the American Heart Association and National Heart Institute as cohosts, in which numbers of outstanding people working in this field will assemble, from all the countries of the world from which they are permitted to leave, for that very purpose of disseminating knowledge and exchanging views, and this is a project for which plans are being laid at present.

Mr. CARLYLE. So, Doctor, you find that there is a free exchange of information among the doctors of the countries of the world?

Dr. WRIGHT. Very free. I think the relationship between doctors today results in perhaps a more rapid interchange of information than in most fields of human activity, except for the countries where little or no information is permitted to be sent out.

The CHAIRMAN. Are there any other questions of Dr. Wilkins?

Mr. HESELTON. Mr. Chairman.

The CHAIRMAN. Mr. Heselton.

Mr. HESELTON. What is your opinion as to the nature and quality of research in this particular field?

Dr. WILKINS. I think that it has improved a great deal.

Formerly I happened to be chairman of the section of the American Heart Association on high blood pressure and at that time we had recently reviewed what we had conceived to be the needs for research in this field with the existing bricks and mortar laboratories then available. A careful study was done and the report of the committee was that $2 million a year could be well spent in addition to what was being spent by the existing facilities, this without expanding them at all.

Now, as to quality, the quality depends on the individual, after all, not the number of people coming into a general field. This means the training of youngsters, and brings me back, and I am sure you will hear this many times again in these hearings, to the matter of medical schools and the training of medical students, interns, residents, and on up the line, research workers, if you will. I am sure that the quality and quantity, but particularly the quantity, could be improved by basic educational processes. I think what we have done so far as compared with what should be done perhaps, shows that considerable is left to

be done. This is a very, very difficult field, one we are more or less just breaking into.

Mr. HESELTON. Have you reached that goal of $2 million?

Dr. WILKINS. No. That goal was nowhere reached because that is for one subject alone, high blood pressure.

That figure is one that was in addition to what was already being done, and this was in 1950, 3 years ago, so that I am sure we have not increased the high blood pressure research by that amount.

Mr. HESELTON. Thank you.

The CHAIRMAN. Are there any further questions, gentlemen?

Mr. WILLIAMS. Mr. Chairman.

The CHAIRMAN. Mr. Williams.

Mr. WILLIAMS. I would like to ask one question. I note in a lot of magazines I have read conflicting articles on quite a number of subjects. For instance, on the effects of smoking on the human system, as to whether or not it produces lung cancer or heart trouble, and so forth. Other articles I have read would minimize that. Should not there be some way for these various organizations to get together and coordinate their work, possibly to the extent that the public would know which ones of these articles were authoritative and which was just merely shelling of the woods? How is the public to know which side to believe?

Dr. WILKINS. If you have a free press you cannot keep people from printing what they want to print so that I think you accept that evil with the good which I personally conceive to be the greater of a free, undirected press.

There are, however, valid and reliable sources of information. To wit, in the heart field we have the Heart Association as a reliable source.

I can testify, speaking again as an individual observing the national group, that the setup in the Heart Association has been most carefully and rigorously controlled, if you will, or guided would be a better word, toward providing only good, authentic information through all bureaus or department of the Heart Association. I think we are all extremely sensitive to the fact that the Heart Association has great responsibilities to the public to see that the information that it puts out is accurate.

Now, you say how do you decide that? We have a rule that no publication of the American Heart Association can appear without having gone through both our committee on publications and our committee on public relations, and if there is any doubt about it it must get approval by the board of trustees itself because we are so conscious of this.

Furthermore, I think Dr. Wright reminded you that we were speaking here this morning as individuals, not as representatives of the association because no one can speak for the association until what he has said, or is going to say, has been approved by these same boards. Therefore, if you want to get reliable facts on the heart you can trust the Heart Association, you can trust the National Heart Institute, and you can trust perhaps a couple of, or several other, accredited informational sources.

Dr. WRIGHT. In further development of this answer, if I may, the American Heart Association provides a service to writers wishing to write authoritative and correct articles for publication.

If such an author requests those services from the Heart Association, carefully selected authorities in that field are given as references and it is arranged for the author to interview those individuals. They then have a chance to review the medical facts which are checked by the publications group within the American Heart Association, and those articles, and there are many of them, are as really authoritative as it is possible to produce them.

We have, of course, no control whatsoever over newspaper or magazine writers who persist on going off on their own. They can write any kind of nonsense they wish. There is no way to check them I know of in a free press.

Mr. WILLIAMS. That is very true, except that most of these articles are signed by doctors. You can pick up the Reader's Digest today, and you will read that the antihistamines are still a very dangerous thing for the public to fool with, and next week you will pick up one signed by a doctor saying that they are the greatest thing in the world, that people should just use them universally, but in a case like that I am wondering if there should not be some kind of a code of ethics or something among men in the profession. In other words, shouldn't they police themselves to the extent that a doctor would be in violation of a regular code of ethics to publish for public dissemination or public reading about an article or medicine or facts or something which has not definately been established? In other words, where it would be purely an opinion, or an individual opinion on his part, should not the profession take action like the lawyers can against a disbarred lawyer, for instance?

Dr. WRIGHT. Actually that is very frequently done.

Mr. WILLIAMS. Do you not have a code of that kind?

Dr. WILKINS. With such an article appearing very frequently the doctor is taken to task by the proper authorities, but it is very difficult to do it before the article appears, and it is unfortunate that so much unreliable material is published, but we are trying to do the best we can to fight it.

Dr. ANDRUS. There are some areas in which doctors, I assume, have an honest difference of opinion on medical affairs just as in other affairs.

Mr. WILLIAMS. Do you think the public suffers from reading those articles by doctors as to the effect, for instance, of tobacco on the human body, where it probably has never definitely established whether it is bad or good?

Dr. ANDRUS. I think the medical profession suffers certainly.

Mr. DEROUNIAN. What about smoking?

Dr. WILKINS. What about smoking?

Mr. DEROUNIAN. Is it harmful, or is it not?

Dr. WILKINS. The best answer I know for that question is one which is not original with me, it is Dr. Proger's favorite answer. He says it does not hurt not to smoke.

Dr. WRIGHT. I think I can dilate a little further on this question. There are individuals who, for one reason or another, have developed that disease known commonly as Buerger's disease, thrombo-angitis obliterans, a disease of the arteries, and there is no question whatsoever but in those cases it is very serious for them to smoke. If they continue to smoke they will probably lose one extremity after another.

The CHAIRMAN. I guess whether it is right or wrong or good or bad depends very much on the individual, and he would have to depend upon his individual doctor for advice.

Dr. WRIGHT. That is correct, and there are some diseases in which it is known to be harmful and others in which it is controversial.

The CHAIRMAN. I do not want to let the committee get into a discussion as to whether a certain cigarette will give you a scratch in your throat.

I can understand the concern some members have. Whether it is for themselves or for the chairman, I am not certain with respect to that. However, to me it is an individual problem that has to be settled by the individual and the advice of the individual physician.

Mr. CARLYLE. Mr. Chairman.

The CHAIRMAN. Mr. Carlyle.

Mr. CARLYLE. Doctor, I am not sure that you told us what percent of the people in this country suffer from high blood pressure.

Dr. WILKINS. It is roughly 10 percent of the total population. It is roughly half of the people between 40 and 60. Those figures I cannot be exact about. I do not think we really know. Hypertension, high blood pressure, usually is a sympton produced. If you do not happen to have had a physical examination you would not know you had it. That is typical because it is discovered quite incidentally, as when you have an insurance examination, and so forth, so as to the exact figures really those are estimates.

Dr. WRIGHT. Are there any other questions, gentlemen?

Mr. DEROUNIAN. I have a question here. It says, Is drinking whisky prescribed for heart disease? My father takes brandy once a day. He is 80 years old. He is not a drinker. I just wonder whether that is a legitimate prescription of a doctor?

Dr. WILKINS. I think the chairman's answer as to tobacco would cover that, too.

Dr. WRIGHT. The answer is that it is prescribed.

The CHAIRMAN. Well, if we have satisfied the desires of the committee and those who wish to drink, if there are no further questions we will recess. I find that in this life you usually take the advice of the person who tells you to do the thing that you actually wish to do. Are there any other questions, gentlemen? If not, this would be a good time probably for us to adjourn for the noon recess. What length of time would you suggest? I see that we are not moving as fast as we expected we would, and I do hope to complete this hearing with these gentlemen this afternoon. They are all appearing here from their particular activities in life; they have made sacrifices in coming, and we do not wish to hold them longer than is absolutely necessary, so I am hopeful that we can conclude with them this afternoon. Would an hour be sufficient for lunch; would that be detrimental to health?

Dr. WRIGHT. No, sir.

The CHAIRMAN. If not we will adjourn for 1 hour.

(Thereupon, at 12: 40 p. m., the committee recessed.)

AFTERNOON SESSION

(The committee reconvened at 1: 30 p. m., pursuant to recess.)

The CHAIRMAN. The committee will come to order.

Dr. Wright, whom do you wish to call as the next witness?

Dr. WRIGHT. I should like to call Dr. E. Cowles Andrus, of Johns Hopkins, to open the talk on arteriosclerosis and atherosclerosis, hardening of the arteries.

The CHAIRMAN. Very well, Dr. Andrus.

STATEMENT OF DR. E. COWLES ANDRUS, OF JOHNS HOPKINS UNIVERSITY, PRESIDENT-ELECT OF THE AMERICAN HEART ASSOCIATION

Dr. ANDRUS. I shall speak briefly on this matter of hardening of the arteries and arteriosclerotic heart disease, beginning with a few fundamentals.

The fact is that if every organ in the body needed to be supplied with blood at its maximum needs all the time, there would not be enough blood to go around. Now, the fact that blood can be shunted to where it is most needed in adequate amounts rests upon the property with which the system of blood vessels is endowed to change their caliber. There is an example of that which you can all feel by feeling the pulse. Every time the heart beats a pulse wave goes throughout the vascular system and the volume of the arteries is actually increased by the amount which the heart puts out with each pulse.

Arteriosclerosis is a process which causes this capacity of the arterial system to vary its caliber to be lost to a greater or lesser extent. For a long time it was supposed that that was an inevitable consequence of aging. As a matter of fact, changes in the arteries, in the sense that they become less elastic, less distensible, do occur as we get older, so that the capacity suddenly or to an important degree to change the caliber is lost to some extent. However, if that was all that happened to us, disease of the arteries would be a much less severe affair than it is.

There is another process which is not a disease of aging which may be present even in childhood in rare examples, and which is coming to be somewhat better understood, though still in a crude fashion. This we distinguish, as contrasted with the simple stiffening of the arteries with age, by another name; we call this atherosclerosis.

Stated in a somewhat oversimplified fashion, this is a fatty degeneration of the arteries. It involves the deposit of fatty substances, undoubtedly absorbed from the blood in the inner coats of the arterial wall, leading to irregular thickenings in the arterial wall. And as the process advances it promotes the formulation of clots in the blood vessels so involved.

Now, that is vastly more common than one might suppose. In the big blood vessel, the big arterial trunk, called the aorta, it occurs in almost everybody. There it does not make very much difference, except for an occasional accident.

But the hazard of this process lies in the fact that it involves other arteries, some smaller, which are also vital, and the most common and most disastrous examples of such involvment are those of the arteries which supply the heart muscle itself, the so-called coronary arteries, and the arteries to the brain.

The statistics with regard to the occurance of these accidents are rather staggering. It is estimated, I think on reliable grounds, that there are about 300,000 deaths from heart attacks—that is the com-

mon term applied to coronary thrombosis, the clot forming in the coronary arteries—in the United States each year. Happily, one of the things that has been learned about this is that it is not so uniformly fatal as was originally supposed. Less than one-fifth of the individuals die in in their first attack. But it is an extremely important abnormality.

Thus far I must confess our knowledge about it is pretty crude. But one particular direction of advance has been fruitful to knowledge if not to application to man. It is alwas true for the experimental scientist in medicine that there is a great advantage to be able to produce or to find the disease in animals upon which experiments may be conducted. Beginning with the observations of a Russian, Anitschkow before the First World War, in 1912, it was observed first that rabbits, if fed a high fat diet, and later that fowls, if fed a diet high in fat, would develop this disease. There are some species differences, but the process is very similar to that in man.

Within the last few years the disease has been produced in dogs, whose circulatory system is more similar to man than that of the fowl. That has given opportunity to apply various methods of relief or prevention to this experimental disease.

I would like to make it clear that in speaking of relief and prevention I am presently confining my remarks to the experimental disease produced in animals. It is not too much to hope that some phase of this may be in the end applicable to the disease in man, but I think it would raise false hopes to indicate that that was true with certainty at present.

I will speak of two directions in which knowledge has advanced in this disease which may be hopeful. The diet of an animal is relatively simple and can be controlled and to some extent the progress of this disease can be controlled by controlling the diet. Attempts to do similar things in man lead to impalatable and intolerable dietary restrictions.

Another line of possibly fruitful investigation stems from a fact which has long been known, that this disease in the human species is vastly more common and more severe in men under the age of 50 than in women. That leads to the inference that it is somehow a characteristic of the sex.

And it has been shown that when the disease is produced in cockerels, if those birds are "feminized" by giving female sex hormones the disease in the arteries can be caused to retrogress. I think that attempts will undoubtedly be made to do this in man. Thus far the observations have been limited to the fact that certain fatty substances in the blood which tend to be high in individuals who have manifestations of atherosclerosis can be reduced in concentration by the administration to the male of the female sex hormone.

Another line of investigation which is being developed is directed at the reduction of the absorption of these fatty substances from the diet with the intent of preventing their accumulation.

Thus far the links in this chain are not very closely tied together, but I think that one has genuine reason to hope that if the present momentum of study and knowledge in this field can be maintained or accelerated that some degree of control of this disease can be accomplished.

I think that is all.

Dr. WRIGHT. Gentlemen, are there any questions you would like to ask Dr. Andrus?

The CHAIRMAN. Mr. Dolliver?

Mr. DOLLIVER. As to the incidence of this disease and the accumulation of the fatty substances on the inside of the vessels, is there a uniform distribution throughout the body, or does it tend to accumulate in certain areas?

Dr. ANDRUS. It tends to accumulate in certain areas, but not the same from individual to individual. In large series—I mean thousands of autopsies—it has been shown, to take the coronary arteries, the arteries that supply the heart muscle, that 70 percent of the men in the sixth decade of life have relatively advanced grades of atherosclerosis in the coronary arteries. Obviously, 70 percent of the people at that age do not die of that, but for various reasons—imposed stress or other imponderable reasons—the plaque, the accumulation, happens to develop at a vital point in some and not in others.

Mr. DOLLIVER. Is there any medical explanation for the variation of this deposit in the different areas?

Dr. ANDRUS. There are medical conjectures. High blood pressure trends to foster the deposit of these substances. They tend to occur where stress is greatest and in a branching system like the arterial tree it will tend to occur near where branches leave.

There are three major branches which supply the heart muscle. One of the arteries is involved vastly more commonly than the others. But, as I say, one can only conjecture why, in some phases of this.

Mr. DOLLIVER. Would you care to express your own conjecture on that?

Dr. ANDRUS. Well, I think it is a matter of stress; it is a matter of pressure exerted in the artery. There is not any doubt that the tendency to the serious development of this disease has a hereditary element. It also is fostered and its consequences are evidently more serious with overnutrition. It is notably low in its incidence among the peoples who are undernourished.

Studies have been made in such places as Asia, in which undernourished populations have been examined, and the incidence found to be very low.

Mr. DOLLIVER. Is it your conjecture that it may be the result of a high-protein diet or a high-fat diet?

Dr. ANDRUS. Well, I would not like to be as definite as that. Of course, there is a widespread opinion held in the medical profession that a high-fat diet conduces to this. It also conduces to overnutrition. We do not know that for certain, I think, sir.

Mr. DOLLIVER. The lethal blow in this kind of a disease is generally some occlusion or something of that kind?

Dr. ANDRUS. It is.

Mr. DOLLIVER. What generally brings that about? Is there any general cause of that occlusion?

Dr. ANDRUS. Well, again, one can speak from averages rather than from the individual. It is often very difficult in the individual to learn precisely what event or what stress has led to this.

As I say, it occurs more frequently in those who are overweight. It is much more frequent in men than in women. It is more frequent in those with high blood pressure than it is in those with normal

blood pressure. And it tends to occur in the background of stress and fatigue. Overwork is, I think, undoubtedly a contributing cause.

I cannot trace cause and effect exactly, but it seems to be true in many instances.

Mr. DOLLIVER. Thank you, Doctor.

The CHAIRMAN. Any further questions? Mr. Carlyle?

Mr. CARLYLE. Doctor, is it usually thought by those who have made a careful study of this subject that most coronary occlusions are brought about by a flake which gets into the blood stream?

Dr. ANDRUS. By a what, sir?

Mr. CARLYLE. By what I call a flake. You used the word "pipe," or it was used this morning. I was just wondering if it were true that the larger arteries might corrode or some substance might gather and a flake would get into the blood stream.

Dr. ANDRUS. That is possibly true in a small number of instances, but much more frequently the thrombosis, the clotting, seems to take place at a site because this particular process, the plaque in the wall, has caused a roughening of the very smooth lining of the arteries and has led to a formation of a clot there. Occasionally the plaque will break from stress and will tend partially to occlude the artery, and then a clot will form in that case.

Mr. CARLYLE. If that clot should hit the brain then you would have a hemorrhage?

Dr. ANDRUS. Well, the particular clot that forms in the coronary artery cannot get to the brain because it is strained out by the finer branches of the coronary artery.

Mr. CARLYLE. The same substance would not cause the brain hemorrhage and a coronary occulsion; would it?

Dr. ANDRUS. Not the very same thing. There is a connection there which I think you may be thinking about, which Dr. Wright is particularly qualified to talk further about. When the clot forms in the coronary artery the heart muscle in the domain of that artery is injured. When the heart muscle is injured a clot may form on the inside of the heart. It is that clot that may break off and go to the brain, so that paralysis, or fatal cerebral embolism, which is the name we give to it, may be one of the complications and consequences of a coronary occlusion.

Mr. CARLYLE. Doctor, is it known to the medical profession what does cause a coronary occlusion?

Dr. ANDRUS. Well, sir, my remarks ought to have demonstrated, I think, that we do not know.

Mr. CARLYLE. I came in just a little late, but from what I heard you say I thought that.

Dr. ANDRUS. There are conjectures and there are things which we believe contribute enough to advise the patient to avoid. Overnutrition, fatigue and unusual exertion seem to precipitate these attacks.

Mr. CARLYLE. Let me ask you this additional question, Doctor: When a person has had a coronary thrombosis and has taken the prescribed treatment and has apparently recovered, is it ordinarily expected that an additional trouble will develop?

Dr. ANDRUS. I think the occurrence of a second coronary occlusion is more common. Another coronary occlusion is more common than the first one was, if I may put it that way. Given a coronary occlusion the patient is likely to have another one, but not inevitably so. There

are plenty of instances in which an individual has returned to his previous occupation and carried it out for 25 years and died in the normal span. It is not inevitable.

Mr. CARLYLE. But, of course, the fact that one occlusion has been experienced makes it more likely that the patient would have another one?

Dr. ANDRUS. I think that is true, sir.

Mr. CARLYLE. That is all.

Mr. DOLLIVER. May I ask one other question?

The CHAIRMAN. Mr. Dolliver.

Mr. DOLLIVER. I overlooked a matter I had in my mind, Doctor. That is with respect to the diagnosis of this condition. Can diagnosis be determined by blood chemistry; or what is the method?

Dr. ANDRUS. To which condition are you referring?

Mr. DOLLIVER. The gathering of this material, or the lessening of the diameter of the blood vessel.

Dr. ANDRUS. The diagnosis of arteriosclerosis or coronary sclerosis is still in a pretty indefinite stage. We diagnose the consequences of it but we cannot diagnose with accuracy the presence of atherosclerosis.

Mr. DOLLIVER. Thank you.

The CHAIRMAN. Any other questions, gentlemen?

Doctor, I have before me a recent article in Look magazine, the issue of September 8, 1953, which is headed, Science Is Conquering Polio, Heart Disease, and Cancer, by William L. Laurence. By way of information it is stated that William L. Laurence, one time a philosophy teacher, has been a medical and science reporter for the New York Times since 1930. He has won two Pulitzer prizes in journalism and as early as 1940 foresaw the approach of the atomic age.

In this article, which I have not had the opportunity to read through, the opening paragraph states:

> The conquest of polio, heart disease, and cancer, three of mankind's most terrifying scourges, is in sight. Within the next 10 years science will bring them under control and in the process will solve some of nature's greatest riddles. The victory, which will be counted among man's highest achievements in his never-ending exploration of the universe, will make you 10 years younger in 1963.

I assume that there can be some truth in a statement of that kind, but I would imagine there would be some difficulty in definitely fixing this fine result to take place within 10 years. Is it your opinion that with what is now taking place optimism in this respect would be justified?

Dr. ANDRUS. Well, I must say I think that Mr. Laurence's expression is a pious hope. I doubt it myself, although I would give a lot to see that come true.

I think one can be encouraged by the progress in the field of research in vascular disease, in hypertension and in atherosclerosis. I am prepared to believe that we may never, or at least for a long, long time, get to the fundamental mechanism. I do not think that it is too much to hope that in a decade we may be able to influence the progress of the disease favorably, to slow it down.

Dr. WRIGHT. Dr. Andrus, would it not be wise to again emphasize the fact that we are dealing with a number of diseases, and that whereas it is quite conceivable that rheumatic fever might yield

readily within 10 years, such a disease as atherosclerosis or essential hypertension might still very well not be solved in that period?

Dr. ANDRUS. I think they are much more imponderable than a disease which is caused by a direct infection. You can put your finger upon the infecting agent and do what you can to eliminate that. This is a much more complicated matter than such a disease.

Dr. WRIGHT. Dr. Jones has a word.

Dr. JONES. I would hope we would accept the fact that it is very dangerous to promise results in any of these frontier problems at any given time, but I think it is safe to say that new methods of approaching the study of some of these problems and new concepts and new opportunities to advance knowledge are existent today as never before in the history of the world. I think that is true not only of the disease stated in general, but of positive health. For instance, studies about the equilibrium, the chemical differentiations that go on to perform biological functions, are going at a rate now which is very exciting.

I think any scientist—though I do not classify myself as a scientist—who promises he is going to solve a given problem at a given time is very foolish. Any newspaperman who does is also foolish.

But the constant support of research in an increasingly better way, in bigger volume, is probably going to pay dividends such as we have not dreamed of. Our present state of contributions of the last 25 years have probably added more about human health and disease than all of the other periods of time put together. The hope of the support of research that we are doing now is that some of the things Mr. Laurence speaks of may come about.

I think that it would be probably very easy to justify the fact that it would be economic to support research at an even much greater level than we are now doing from both official and voluntary sources today, because the only way to evaluate research is by achievement, and the achievements of the past few years make it certain that with new opportunities, methods, and so forth, we are going to learn a lot.

The CHAIRMAN. Well, I assume that you have in mind that today we possess the knowledge of the past as a starting point for the future, so that the progress which is to be made in the future can very readily be much more rapid than it has been in the past because of the greater base from which you work.

Dr. JONES. That is right.

Dr. WRIGHT. Mr. Chairman, in the next section of our discussion we are going to try to analyze what is being done today, what the needs are, and what the direction for the future should be.

The CHAIRMAN. I am very much interested in that. I am glad you called my attention to it, because it will probably eliminate the necessity for a good many questions at this moment.

Mr. MOULDER. Mr. Chairman?

The CHAIRMAN. Mr. Moulder.

Mr. MOULDER. Dr. Wright or Dr. Andrus: I was curious to know what difference there is, if any, in the prevalence of heart disease such as you have discussed here among women and men. If there is a difference, what are the statistics?

Dr. ANDRUS. The process I have been talking about, particularly atherosclerosis, is about four times as frequent in men as it is in

women up to the age of 50. After that it tends to even off. Men who survive into the ninth decade then having it become less common.

Mr. MOULDER. Why is that?

Dr. ANDRUS. I cannot tell you, sir. The implication is that there is some sex-linked process of physiology that influences it. I mentioned in my remarks that this has been applied experimentally. If the disease is produced, as it can be in cockerels, by feeding them abnormal quantities of fatty substances and the cockerels are "feminized" by giving the female sex hormones, the disease literally clears up.

Mr. MOULDER. That is the reason I asked the question.

You mentioned hormones. What information do you have on that?

Dr. ANDRUS. The hormonal approach is being applied in a very minor way in man. It has complex and some nonacceptable side effects which have minimized its use, I think.

Mr. HINSHAW. Dr. Andrus, I am bothered in my hearing, I thought I heard you say atherosclerosis as opposed to arteriosclerosis.

Dr. ANDRUS. Atherosclerosis?

Mr. HINSHAW. Yes. Will you distinguish between those two terms?

Dr. ANDRUS. Arteriosclerosis is used in two ways. In one it is a generic term applied to more or less a variety of diseases of the arteries, but that term is too inclusive to be accurate. There is a process which advances as we age in which the arteries become less elastic and that is a vascular disease which inevitably happens to all of us. The disease upon which I was concentrating my remarks is a particular disease which is not an inevitable consequence of age, and it is due to the disposition of fatty substances in the walls of the arteries. That has been given the term "atherosclerosis," which name comes from the name of the deposit itself. That is the killing disease.

The CHAIRMAN. Are there any further questions, gentlemen?

I would like to ask just a question or two in this connection, because I understand Dr. McCormick is of the opinion he would be called by 2 o'clock. He had an engagement which he had to meet and so I will put this question with regard to this article by Mr. Laurence.

This statement appears in the September 8, 1953, issue of Look magazine and is as follows:

> The attack on diseases of the heart and blood vessels is moving forward on two fronts—the chemical and the surgical. On the chemical front, significant progress is being made. In surgery, we are making spectacular advances by changing new arteries for old and by learning to patch up old and damaged hearts.
>
> In the last 5 years, chemistry has uncovered more and more evidence that heart conditions arise from the presence of specific chemical agents in the bloodstream, produced by some faulty chemical process of the body. These chemical agents now are being identified. They cause the arteries to lose their elasticity, and they narrow the channels which carry vital substances through the bloodstream. These conditions, in turn, lead to high blood pressure and damage to the heart muscle.
>
> In the light of present progress it is possible to predict with certainty that within 10 years we will have established fully the causes that put these abnormal chemical agents in the bloodstream and arteries. In animal experiments, scientists have already succeeded in producing hardening of the arteries and then reversing the process back to normal. This knowledge is not yet ripe for application to humans. But beyond question it will be ready by 1963, if not earlier.

That is almost what you have said with regard to some accomplishments, although you are not inclined to be too definite as to the time in which it will be brought to fruition.

Dr. ANDRUS. That is true.

The CHAIRMAN. This article from Look by Mr. Laurence refers also to the discoveries by the National Heart Institute and to others on the subject, which you have touched upon, particularly this fatty matter in the arteries, and it is on that basis, I think, that he says within 10 years we may have it licked. That is probably what was the theory behind this article in Look magazine, as I gather from reading what I can of it very quickly.

Would you agree with that statement that on the chemical front significant progress is being made and that in surgery we are making spectacular advances by exchanging new arteries for old and by learning to patch up old and damaged hearts? I do not know in what sense he is using the word "damaged" in this instance.

Dr. ANDRUS. I think he is perhaps drawing conclusions about patching up the old and damaged hearts, but the surgeons can do some pretty wonderful things about the replacement of damaged arteries with arteries from other individuals, as Dr. Wright very well knows.

The CHAIRMAN. Well, it is all very interesting what we hear on this subject, and without making too much of it, I hope you will not discourage too much the thought that in 1963 we will have 10 years added to our life.

Dr. ANDRUS. I hope for that, too.

The CHAIRMAN. Are there any other questions, gentlemen?

If not, who would the next witness be? Would it be Dr. McCormick?

Dr. WRIGHT. I think Dr. McCormick has come in and we would be very glad to have him give us his presentation.

The CHAIRMAN. I do not want to interfere with the regular presentation, but that notation was brought to me by the staff which stated that he desired to leave this afternoon.

I have here a very comprehensive statement on the background of Dr. McCormick which covers not only his activity in medicine but also in general practice in a very large way. It also gives the fraternal organizations to which he belongs. He is on a good many medical boards, and I would like for each of the witnesses who are here to feel perfectly free to make available to me their background to the fullest extent. They may wish to set it forth in these hearings. If that information is furnished to me I will do it and save your modesty by not requiring that you say these fine things about yourself, but if will present them to me and call them to my attention, I will see that they are used.

STATEMENT OF DR. EDWARD J. McCORMICK, TOLEDO, OHIO, PRESIDENT, AMERICAN MEDICAL ASSOCIATION

Dr. MCCORMICK. Mr. Chairman and members of the committee, I am very happy to be here today as the president of the American Medical Association.

I hope that I am not interrupting to any extent the proceedings of your committee by appearing at this time, but I want to make a formal

statement on behalf of the American Medical Association which I have prepared, and if the chairman so desires, I shall read this statement.

I am Dr. Edward J. McCormick, of Toledo, Ohio, where I am engaged in the active practice of medicine. I am president and a member of the board of trustees of the American Medical Association. I am appearing here today as a representative of that association to discuss our interest and activities in the field of medical research, and to offer to your committee our complete cooperation and the use of our facilities in connection with your current inquiry.

It is our understanding that this hearing has been initiated by your committee for the purpose of studying the causes, methods of control, and the extent of medical progress in connection with several specific diseases. It is apparent from the list of organizations which are scheduled to testify that complete and authentic information in this regard will be available to you.

For that reason it has been decided, with the approval of Mr. John H. Teeter, special consultant to your committee, not to present a separate statement with respect to each of the diseases to be covered. In addition to my statement, a representative from the Washington office of the American Medical Association will be in attendance for the entire hearing. If there are any questions which the committee may want to direct to the association, our representative will either supply the answer, or refer the request to our headquarters in Chicago for necessary action. Finally, at the conclusion of the initial phase of the hearings we will be happy to submit a written statement or send another witness to discuss in detail any controversial issues which may arise. It is our belief that this approach will conserve the time of the committee, and prevent duplications in the presentation of basic material.

The one exception to this plan will be made tomorrow when the subject of cancer is to be discussed. In view of the extensive work of the American Medical Association in this field, I have asked Dr. Paul Wermer, the secretary of our committee on research, to outline for you the activities of the association concerning cancer diagnosis, treatment, and research.

With these introductory remarks I should like to proceed to a brief statement concerning the composition, purposes, and program of our association.

The American Medical Association was founded on May 5, 1847, when 250 delegates representing more than 40 medical societies and 28 colleges, embracing medical institutions in 22 States and in the District of Columbia, met in Philadelphia, Pa. It has since grown from an organization of a few thousand to a membership of approximately 140,000, with 53 constituent State and Territorial medical associations and about 2,000 component county and district medical societies.

The American Medical Association is a physician's organization existing to serve the medical profession and the general public. Since its inception it has campaigned to elevate the standards of medical education, licensure, and public health; to maintain its high ethical standards; to oppose charlatanism; to promote clinical and scientific investigation, and to make available a better quality of medical service.

Although the American Medical Association acts collectively for physicians in the socioeconomic field of medicine, which includes ethics, laws and legislation, medical service, economic research, rural health and health education, primary emphasis is placed on its scientific activities.

During the year 1952 over 80 percent of our expenditure of approximately $10 million was devoted to this work. These activities are conducted largely by the council on medical education and hospitals, which is the council which has laid down the minimum standards for hospitals and for medical schools. The council on scientific assembly, which has to do with the great scientific meetings which we hold several times a year; the bureau of exhibits, of which I was chairman for several years, and many of you may have visited some of our meetings and seen the exhibits which we had on display.

I presume that probably nowhere in the world can one see so many of the recent advances in medicine depicted so that everyone can understand them as you can see them at our conventions and meetings as they are produced by the bureau of exhibits. Our committee on mental health, of course, is very active and is having a very large meeting here in Washington I believe during the next 2 weeks. Then we have our council on pharmacy and chemistry, the council on physical medicine and rehabilitation, and our council on foods and nutrition, our committee on cosmetics, our committee on research, bureau of investigation, and the chemical laboratory and microbiologic laboratory.

It would take considerable time for me to discuss in any detail the purposes and programs of these units of our association. Suffice it to say that all of their work is extremely important in advancing the science of medicine. The outstanding reputation of the members of these councils and committees for specialized scientific knowledge and integrity is well recognized. These men serve without remuneration and render unbiased decisions based on careful considerations of all available scientific evidence and expert opinion.

Through the Journal of the American Medical Association, published weekly, and the nine monthly scientific journals, as well as several special books, the association aids physicians in their search for new medical knowledge. These publications assist the medical profession in keeping abreast of medical developments, serve as an important means of postgraduate medical education and carry information on organization activities, as well as on Government services.

In addition to such interassociation groups, the American Medical Association has for many years engaged in a variety of cooperative undertakings with allied health agencies as well as with the State and Federal Governments. The operations of three such joint agencies which are currently in existence may be of interest to your committee.

The National Research Council: This agency was established in its present form in 1916 by the National Academy of Sciences and organized with the cooperation of the National Scientific and Technical Societies of the United States. Its purpose is to promote research in the natural sciences and in their application to medicine and other useful arts with the object of increasing knowledge, strengthening the national defense, and contributing in other ways to the public welfare. To this end the Council furnishes professional and research

advice to governmental and other organizations, and administers such funds as may be entrusted to it.

The American Medical Association maintains liaison with the National Research Council through representation on the Division of Medical Sciences and the Food and Nutrition Board. In this capacity we are able to assist and cooperate in the effective prosecution of the Council's work.

The Commission on Chronic Illness: This commission was founded in 1949 as a nonprofit organization by the American Medical Association, the American Hospital Association, the American Public Health Association, and the American Public Welfare Association. At the present time 12 national organizations contribute financially and professionally to the program of the commission.

Studies of the commission include those to determine the prevalence and incidence of the major chronic diseases, and how many and what services are needed; studies to determine effective means of prevention, rehabilitation, and care; factfinding projects to learn what services and facilities are now available and what kinds of planning are going on.

Briefly, it can be stated that the goals of the commission are to define the problems arising from chronic illness in all age groups; pave the way for dynamic programs to prevent chronic illness, minimize its disabling effects, restore its victims to a socially useful and economically productive place in the community; clarify the interrelationships of the many professional groups and agencies working in the field; coordinate the separate programs designed to meet more effectively the needs common to all the chronically ill; stimulate in every locality a well-rounded plan for the prevention and control of chronic disease and for the care and rehabilitation of the chronically ill; and modify society's attitude that chronic illness is hopeless.

Committee on relations between medicine and allied health agencies: In June 1952 the house of delegates of the American Medical Association authorized this committee for the purpose of establishing better coordination and understanding between voluntary health agencies. It was also the intention of the house of delegates to encourage the development of case-finding methods, in the office of physicians, which would be more effective than the mass surveys employed by most public and private agencies.

Now, a word about medical programs in general. The advances of medical science since the beginning of the 20th century offer convincing evidence of what can be done when competent researchers have an opportunity to work with freedom, facilities, and funds. A review of the medical discoveries since the turn of the century would require volumes. Drugs and operations, for example, alone could provide endless material for discussion of the onward march of medical research. Insulin, vitamins, sulfonamides, penicillin, and other antibiotics are only a few of the outstanding discoveries in the drug field. The words "isotope" and "betatron" have become a part of the medical language. Even entirely new approaches to illness have been discovered, as a result of which, the full possibilities of formerly practically unknown subjects, such as physical medicine and rehabilitation, are being explored with a thoroughness that offers much promise for the future. Truly, the past 50 years have been remarkable for those

who devote their lives to the prevention of illness and the treatment of the sick.

The decline in the general mortality rate from 17.2 deaths per 1,000 population in 1900 to only 9.6 in 1950 underscores the health progress during this period. While the population has doubled, the number of persons over 65 years of age has quadrupled in this period, and a significant gain in life expectancy, even in late middle age, has resulted from the mortality reduction. Life expectancy at birth in 1900 was estimated at 47.3 years; in 1949 it was 67.6 years. I believe at the present moment it is in the neighborhood of 68 or 69.

Major mortality gains have resulted from preventive medicine and the development of specific cures. Preventive medicine has been successful in eliminating, in a large measure, the spread of disease. Medical research has developed many effective methods of immunization and disease prevention; these have been widely used by public-health agencies and sanitary engineers under the capable guidance and direction of the medical profession. I am sure most of the doctors who have been speaking to you today will agree with me. I have practiced medicine for 25 or 30 years and I know now that some of our young men coming out of medical schools who are well prepared, will never see and never treat some of the diseases which we have been called upon to treat during the past 25 years. Those diseases are becoming now only of historical interest.

I have said in each of my addresses lately that I believe that the doctor of the future will spend most of his time in the field of preventive medicine, as I pointed out in New York.

In conclusion, I should like to say that the American Medical Association will continue to support all programs for the good of the health of the public, as we have done over the years. We shall fight, however, with all of our strength, matters that are not in the public interest. Our Association has, throughout its history, been a champion of sound progress in medicine. It has had to fight many battles against quackery, improper governmental interference, and against slipshod medical training and practice. We have found that an organization cannot be strong and fearless in defending its principles without creating bitter enemies and staunch supporters. We have both today.

This concludes my formal statement. I want to thank the committee for allowing our association an opportunity to participate in these important hearings. I shall be happy to answer to the best of my ability any questions which members of the committee may have.

If there are any questions that I can answer I shall certainly be happy to answer them and if I cannot answer them, I know I am surrounded by experts who can.

In connection with our relationship with other organizations, it was my privilege to speak last night at Highland Park, Ill., at the meeting of the bureau of health education of the American Medical Association and the National Education Association, which were meeting there talking about all the problems which you are talking about in your committee at the present time. There were educators, social workers, doctors, health officers, parent-teachers, and all types of people who are interested in the welfare of the public and in public health.

It is very encouraging to me as president of the association to stand before such groups with what we thought a few years ago might be different interests and to find now that we are all aiming at the same goal.

I thank you very much.

The CHAIRMAN. Are there any questions, gentlemen?

Mr. HESELTON. Doctor, I would like to have a little clearer what the work of your committee on research is. I understand that you will have Dr. Wermer confine himself to that activity concerning cancer diagnosis and research. What other research are you now engaged in?

Dr. MCCORMICK. Dr. Wermer—I have not read his statement—but I know he has a complete statement on the council or committee on research, and I think is scheduled to give you the entire details of the activities of that committee tomorrow.

Mr. HESELTON. That does not go beyond cancer research?

Dr. MCCORMICK. Yes.

Mr. HESELTON. On the second page of your statement, I am not clear as to what you mean when you say:

> Primary emphasis placed on scientific activities—

and then go on to say in the next paragraph:

> During the year 1952 over 80 percent of our expenditure of approximately $10 million was devoted to this work.

Do you mean to scientific activities?

Dr. MCCORMICK. Well, I am counting of course the activities conducted for instance by the council on medical education and hospitals, which is a very high-class piece of scientific work. The council on scientific assembly, of course, is entirely a scientific endeavor, as is the work of the bureau on exhibits and the committee on mental health, and the council on pharmacy and chemistry and the council on physical medicine and rehabilitation. As a matter of fact, most of the committees of the American Medical Association and council are devoting their time and work and money to scientific pursuits, and not necessarily for the good of the profession but for the good of the public.

Mr. HESELTON. Does the association maintain any laboratories?

Dr. MCCORMICK. Yes; we have laboratories, sir, at our headquarters office in Chicago.

Mr. HESELTON. Do you have some permanent research staff?

Dr. MCCORMICK. Yes, we have a permanent staff of about 1,000 employees at the headquarters of the American Medical Association at 535 North Dearborn Street, Chicago.

Mr. HESELTON. Are you doing any work specifically with reference to heart conditions?

Dr. MCCORMICK. Am I?

Mr. HESELTON. Is your research group doing that work?

Dr. MCCORMICK. Oh, the research group. Well, with these men here, they could probably answer that question as to the participation of the American Medical Association and its research committee in the heart question better than I could. They are all heart specialists and they know what the association has done and is trying to do. Certainly, I can say without fear of contradiction that the association has supported every effort that has been made in the heart field.

Mr. HESELTON. That is all, Mr. Chairman.

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The CHAIRMAN. Are there any further questions, gentlemen?

Mr. MOULDER. Yes, Mr. Chairman, I have a question.

On page 4, Doctor, you make a brief statement with reference to the medical discoveries since the turn of the century. Has the American Medical Association contributed anything toward the discovery of the drugs which you mention on page 4, such as insulin and penicillin?

Dr. MCCORMICK. Did it, directly?

Mr. MOULDER. Yes, sir; or through its research laboratories?

Dr. MCCORMICK. I do not think I can honestly say that the American Medical Association discovered sulfonamides or penicillin or anything of that kind. Of course, Dr. Fleming discovered penicillin, and the association as an organization had nothing to do with the discovery of some of those treatments.

Mr. MOULDER. What would be the attitude of the association, if you could express it, as to how any public funds or money should be expended in research facilities?

Dr. MCCORMICK. Well, of course, that is a great problem and we are spending a lot of money on research now. I presume that it is probably the job of this committee to find out whether that money is being properly expended or whether less should be expended or whether more should be expended. As far as I am concerned—and this is my personal opinion and not the opinion of the American Medical Association, necessarily—I think that we are doing a grand job in the United States in research and I feel that funds are being made available to our research workers from many, many sources, including the Public Health Service, the various foundations, some from the Government and some from private sources, and it is my opinion, having visited many of these institutions, that that money is being very well used and that progress is being made.

I would hesitate to say that the program should be enlarged. Certainly, I would not say it should be in any way curtailed. I was interested in what the chairman had to say about Mr. Laurence's article; I have not read the article which he was reading, but I was also interested in what one of my colleagues here had to say about what was going to happen during the next 10 years. I am inclined to agree with Mr. Laurence. Of course I am a surgeon and I do not know too much about some of these medical conditions, but I think it will not be long before we have a definite preventative for poliomyelitis. At least, it looks very hopeful and I am quite sure that probably within the next 10 or 15 years maybe, our entire conception of cancer and the treatment of cancer may change very radically. Of course, at the present time surgery and radiologists are curing many cases of cancer.

The medical profession will never be satisfied until we can cure them all and until we can prevent cancer.

Incidentally, we have prevented a great many cases of cancer. We do not now see the cases of cancer of the mouth and some other types of cancer that we have formerly seen in our younger days because those people know now how to take care of their mouths and the fact that irritation is reduced. The incidence of some types of cancer I think has gone down while other types have seemed to have gone up.

I do believe, and I hope, within my lifetime that we will have the solution which Mr. Laurence has referred to, and I am optimistic enough to believe that with the number of great men who are working

in these fields and devoting their life and souls to it that we will reach the goal and that the medical profession eventually will be in the preventive field largely.

Mr. MOULDER. My point is this: With heart disease, for example, being of such grave importance, it is important to the people of America to believe that public moneys or Government money or taxpayers' money as it is commonly referred to should be contributed for that purpose as necessary and as could be effectively used.

Dr. MCCORMICK. I have not any idea how much money is being collected for that particular type of research at the present time. I understand that it is a rather sizable fund, and I think probably the men here at the table will be able to answer that better than I can.

I would say this, however, that fundamentally I believe it would be best if all of this work could be done on a voluntary basis without too much Government help.

In other words, I think we are doing a pretty good job in most fields of research at the present time. I think the Government is doing a good job, but I do not think the Government ought to go overboard on it. I think it ought to be left so far as possible to the voluntary American way of doing it.

Mr. MOULDER. I would like to say that I think the Government is spending a lot of money for less worthy purposes than the research facilities that are being discussed here today.

Dr. MCCORMICK. I would be inclined to agree with you on that.

I am looking forward to the conclusion of your committee work and to the time when you have finished these hearings. They will be of great interest to American medicine.

The CHAIRMAN. Are there any further questions, gentlemen?

Dr. McCormick, from the statement that you have given, it would seem as if your association was giving consideration to what some of us of this committee consider a very important matter, and that is the commission on chronic illnesses.

I am inclined to believe that we will be able to utilize that committee and what it has accomplished before these hearings are finally concluded, because it is the economic cost to the American people as the result of these chronic illnesses that most concerns this committee.

Dr. MCCORMICK. Well, it is the great concern of the doctors of this country and that is the reason we are putting money and time into this commission. I can assure you that, whatever you would like to have from the commission on chronic illnesses, it will be available to you.

The CHAIRMAN. Thank you for the offer of your association to be helpful to this committee. It is greatly appreciated and we shall feel free with the encouragement you have given us to take advantage of it whenever and in whatever way we can use it.

Dr. MCCORMICK. We are anxious to have you call upon all departments of the American Medical Association for anything you may desire. It is there for you and we will produce it.

The CHAIRMAN. We thank you for the offer and we thank you for your personal presentation here today and for the assurances which you have given us, as well as the information you have given us from your testimony.

Dr. McCORMICK. Thank you, sir.

The CHAIRMAN. Dr. Wright, you may proceed.

Dr. WRIGHT. I believe Dr. Jones has something to say.

Dr. JONES. Could I address myself to one remark that was asked of Dr. McCormick, and that is the question of the public moneys being used, to just say that if it had not been for the National Institutes of Health research programs of the past few years, it seems practically certain that medical science and work going on in voluntary and State institutions throughout the country indeed would have been very heavily handicapped. The method of administration of these grants is a technique which is known very little to the public and is probably one of the most extraordinarily successful ways in which public funds can be utilized with about as complete freedom as is possible.

For instance, the national advisory councils, after a review of applications by study sections of scientists, take final action or recommend then to the Surgeon General what is to be done, and he has the power of veto, which has been rarely used. In the operation of this very important program, in essence these are public moneys for research support awarded to scientists largely upon the advice of private citizens, other scientists, and public and private leaders of a very high type.

During the course of these hearings reference will be made to the accomplishments along this line and they are really almost unbelievable and of vital importance.

I would certainly hope that the private agencies in this instance here will get increased funds also, but we need both the private and the public and multiple sources in each if we are going to have the real opportunity for freedom of scientific development which we very badly need to foster more and more in this country.

The CHAIRMAN. With reference to what you have said, I noted particularly the testimony of Dr. McCormick. In his first few words he first indicated to me that there might be objection to expenditure of funds through governmental agencies, but as he progressed with his statement, it was made aware to me that he was not in opposition to what is being done through the Public Health and the research programs of the National Science Foundation.

I think what he did say finally was that they did not want to see too much governmental help, and I am not too fearful that you will ever get too much governmental help. I am hopeful that you will get considerable help as a matter of fact.

Dr. WRIGHT. Mr. Chairman, we should like to address ourselves now to the question of what is being done today by the various agencies.

The CHAIRMAN. All right.

Dr. WRIGHT. Dr. Jones has already touched upon this briefly. I will divide this into what is being done by the American Heart Association, and in very brief outline form and then mention other agencies, and we will ask the United States Public Health Service to present a summary of what they are doing.

Five years ago, or more, the American Heart Association had very little money to give or to distribute for research purposes. But, in the last 5 to 8 years this has markedly increased as a result of the

annual solicitation of funds. It is expected that something in the realm of $2 million or more will be made available for research grants and fellowships, investigatorships and various other types of encouragement to research.

I would like to call to your attention a booklet which has been distributed to each of you entitled, "The Executive Staff Report of the Assembly". On the front cover is the picture of a pie which is sliced as we slice our funds. As you will see for any moneys that come to the headquarters of the American Heart Association, we have an ironclad rule that 50 percent, or more, must be given for research. The rest may be divided among administration, public education, medical education, public health, and so forth, but more than 50 percent of every dollar that comes to the headquarters is devoted to research. It is committed before it goes into the pot, so to speak, by being placed in the special fund and cannot be diverted from that fund. That is a matter of policy in the Heart Association.

The money that is retained by the affiliates throughout the country is divided in various ways, but many of the affiliates apportion 50 percent, and some of them a considerably larger sum, for research. In some cases where they are just getting started and the amounts of money are very small, the proportion that goes for research today is not as great, but the total is growing very rapidly. Considering the money, as was pointed out a few minutes ago, that is expended in this country for many lesser causes, this is a very small amount of money, indeed. We recognize that.

Between the years 1949 to 1953, the number of fellowships that were awarded, and this is the way in which we educate young men to later take the leadership in the field of cardiovascular diseases, increased from 26 to 53, and the grants-in-aid in different institutions grew from 19 to 70. In addition, we have more senior workers and career investigators. This is a new approach in order to give a man a lifetime of security in his work in this field. It really is following along the line of what Dr. Jones has made an earnest plea for today.

We select with great care and the selection takes sometimes several years to pick an individual, one individual, from men who have done very outstanding work and who are in their young middle years and have established themselves and who wish to devote their entire working life to research without interruption either from having to earn a living and practice or to even teaching to an excessive amount or doing administrative work.

So far, since this has been established and in the period of about 4 or 5 years, only 3 such men have been selected. They have complete independence as to where they work and so forth. They can move from one university to another in order to improve the situation under which they may work. Their salary is good and they are kept ahead to a considerable degree in their department.

This is a new idea, but a very profitable one, and other organizations are watching to see how this may be useful to them and perhaps to emulate it.

The research grants in the American Heart Association in all of the various aspects, are made by having the applicant apply with a sponsorship. These applications are processed through a receiving committee which operates without pressure, even from the president,

as I can testify, because having been president, I think it is normally recognized that the president makes no approach whatsoever to the research committee in the interest of any particular investigator.

When a problem comes up before the committee any member of the group leaves the room during some period of discussion, if and when it is not appropriate for him to remain. It is about as unbiased as we can make it. These grants are processed very carefully by the research committee. While I am sure some mistakes may be made, they are honest mistakes and it is about as unbiased as it is possible to have it.

There is another folder here which you may refer to which is called the Fellowship and Research Grant Awards. I do not wish to read all of these names of the awards, but it is available for your observation and information. These are grants and awards which were made during 1952 or 1953.

The CHAIRMAN. I have looked through these two pamphlets to which you have just made reference. I think that there is a great deal of very worthwhile information contained in both of them, and it is my intention to make them a part of the record of this hearing as well as the general statement on heart disease which was prepared by the National Heart Institute, of the National Institutes of Health, Public Health Service, United States Department of Health, Education and Welfare, which will be made available to the committee. They will all be made a part of this hearing.

(The matter referred to is as follows:)

HEART DISEASE

Prepared for hearings of the House Committee on Interstate and Foreign Commerce, October 1, 1953, National Heart Institute, National Institutes of Health, Public Health Service, United States Department of Health, Education, and Welfare

THE SIGNIFICANCE OF HEART DISEASE

Heart disease is not one disease, but many. More than 20 kinds of diseases of the heart and blood vessels are included in the popular, widespread usage of the general term, "heart disease."

Rheumatic, hypertensive, and arteriosclerotic heart disease—the 3 major forms—account for over 90 percent of the total heart-disease problem.

Secondly in significance insofar as number of deaths and cases is concerned are heart afflictions resulting from congenital defects, syphilis, diphtheria, pulmonary conditions, tuberculosis, diabetes, hyperthyroidism, parasites, anemias, trauma, tumors, toxic states, diseases of the endocrine glands, neurocirculatory asthenia, and others.

The following facts are staggering to the imagination but they only give the cold statistical evaluation of the problem. No tools are available to measure precisely the human suffering involved and these facts are only suggestive of the tremendous economic loss.

HEART DISEASE AS A CAUSE OF DEATH AND ILLNESS

1. Heart disease is the leading cause of death in the United States.
2. It causes more than 1 out of every 2 deaths each year.
3. More than 785,000 may die in 1953 from heart disease.
4. It is a leading cause of death in the childhood ages.
5. It causes around one-sixth of all deaths in the military ages, 20 to 39.
6. It causes some one-third of all deaths in the productive years, ages 35 to 54.
7. It causes about one-half or more of deaths in the ages 55 to 74.
8. It causes far over one-half of deaths in those 75 and over.

HEART DISEASE AS A CAUSE OF MANPOWER AND ECONOMIC LOSS

1. About 3½ percent of all World War II selective-service registrants examined were rejected for heart disease.

2. Three hundred seventeen thousand five hundred men were in rejected classes as of August 1, 1945, because of heart disease.

3. About 80,000 men were given disability discharges from military service or died in service from heart disease in the war years 1942–45.

4. Rheumatic fever alone immobilized more than 40,000 men in the Armed Forces during World War II.

5. Rejections from military service for heart disease were high during the Korean conflict. In 1 area in 1 State, it was found that 1 out of every 8 men rejected, all under 26 years of age, were turned away because of organic heart ailments.

6. In the Navy alone, in World War II, 4 million man-days were lost because of rheumatic fever and rheumatic heart disease.

7. The actual or potential manpower contribution—to defense or the Nation's general productiveness—of 1 person in every 15 or 16 is limited to some degree because he or she has heart disease.

8. Approximately 176 million workdays are lost yearly because of heart disease.

9. At least 653,000 man-years are lost each year in industry alone owing to heart-disease disabilities.

10. About $2,124,209,000 was estimated to have been lost in 1951 in productivity as a result of heart disease.

11. Compensation and pension payments to veterans in 1950 because of heart-disease disabilities were $168,250,000.

12. The proportion of insurance claim payments for deaths from heart disease has been steadily rising, a company report shows. In 1951, one major company paid to beneficiaries on account of heart disease a total of $173,680,000. This sum was about 3½ times the amount paid in 1931.

13. Of some 20,000 people who die each year of heart diseases in 1 State, according to an estimate, the known duration of the disabling phase of the disease was, on the average, at least 8 years.

14. At a hospital rate of $12 a day, according to an estimate and example cited by an authority, 1 patient with chronic heart disease costs $4,380 a year to maintain. This would mean that, if 50,000 patients with heart disease received hospital care for a year, the cost in 1 year would be $219 million.

15. Sixteen thousand dollars per case, or a total of $640 million was the cost of the cases of the 40,000 men inactivated by rheumatic fever alone in the World War II period.

16. Heart disease has incapacitated about one-fourth of the 150,000 persons who are beneficiaries of the federally aided program of assistance for permanently and totally disabled persons.

The following is one small indication of the importance of heart-disease disability:

The Bureau of Public Assistance of the Social Security Administration, Department of Health, Education, and Welfare, after a cross-section survey of 13,200 of 93,359 recipients of aid under its program for the permanently and totaly disabled in the age bracket 18–65, reported very recently that diseases of the heart were found more frequently than any other group of diseases or impairments.

Cardiovascular disease accounted for the major or secondary impairment in over 42 percent of the recipients, and was the major impairment in 37 percent of the total recipients; 25.5 percent of these were people in which the disease directly affected the heart, while the remainder suffered from general arteriosclerosis and arteriosclerotic complication in cerebral paralysis, and from hypertension without mention of heart involvement.

Almost 71 percent of the recipients with a disease of the heart were aged 55 or over. Over one-fourth, however, were in the age bracket 35–54.

For about 1 in every 4 of the recipients with heart disease the impairment was of 10 or more years' duration.

HEART DISEASE AS A CAUSE OF LOSS AND A BURDEN TO THE INDIVIDUAL, THE FAMILY, AND THE COMMUNITY

Heart disease affects the individual, his family, and the community. Every case of heart disease, whether it results in immediate death, in severe and pro-

longed disability, or in less drastic effects, imposes a burden and causes loss. These and other considerations are involved in all cases of heart disease. The following illustrations show the specific meaning of this.

No. 1

A boy of 8 years has an attack of acute rheumatic fever. What does this mean for:

The boy:

1. He suffers physical pain and undergoes the danger of psychological as well as physical crippling.
2. He must be kept in bed for prolonged periods, owing to the nature of the disease's effects in his case.
3. He will have to make many adjustments, even though the disease is eventually conquered in his instance, perhaps involving giving up cherished activities.
4. He may well lose his sense of belonging to his age group; he may drop out of or behind in school and never regain his place in that life.

His family:

1. The whole character of the family's life must adapt to the presence of a dangerous, long-term illness in one of its members.
2. The costs of the illness may place severe strain upon the family income.
3. Sacrifices of many kinds will have to be made by the family.
4. An elder brother may not be able to go to college because of the financial burden of the illness upon the father's resources.

The community:

1. The cost of home teaching help, if the community has a program for this.
2. The cost of home nursing, recreational and medical social services, if the community has a program for them.
3. Time and effort and organization for these and other things to help the rheumatic child.
4. Heavy hospital and other costs, perhaps, if the case becomes a charge upon the community.

No. 2

A mother develops high blood pressure and hypertensive heart disease. What does this mean:

For the mother:

1. Pain and suffering, psychological as well as physical.
2. Cutting down on or abandoning many of the things she has been doing for her family.
3. Giving up, say, civic club activities in which she is especially interested and for which she performs a valuable community service.
4. Adjusting to a whole new way of life, living under and conquering as best she can the handicaps of the disability.

For the family:

1. Accepting the tragic fact that their mother can no longer be the same and do the same things that she has done for years.
2. Not only taking up a larger share of home responsibilities, but also helping the mother to adjust to the illness.
3. Heavy expenses may be incurred.
4. Cherished vacations or other plans may have to be dropped.
5. Many new burdens will have to be carried by each member.

For the community:

1. The loss of a valuable and hard-working community member.
2. The cost of helping her, through whatever appropriate services the community provides, to adjust to the disability.
3. The time and effort and organization, as well as the money, that this takes.

No. 3

A man of 45 collapses one evening at home with a heart attack. It turns out to have been an acute coronary thrombosis or clot. But good medical treatment and care, good sense in following the physician's advices on his part, and nature's

developing collateral circulation help bring him through. He loses only a few months from work and returns to his job. What does this mean:

For the man:

1. Suffering and fear of death at least for a time.
2. A continuing threat of disability and death.
3. Changes, to some degree, in his way of life at home.
4. Changes, to some degree, in his working way of life.
5. A financial burden that, despite health plan measures subscribed for and maintained and used, may mean he must give up plans for an adequate home for the family.

For the family:

1. Worry over their father's condition, and adjusting to it.
2. The threat that the source of support may be lost through death or disability.
3. Giving up, perhaps, some of the necessities of a wholesome family life.

For the community:

1. Loss of productivity by his company.
2. A financial loss, by the company, because of this.
3. A threat of the complete loss of a valuable and productive member.
4. The necessity for possible future expenditures in caring for him in a hospital or in other ways if he becomes a charge upon the community.

Thus, and in many other ways, every case of heart disease, from the less severe types to those of complete disability and death, affects the individual, his family, and the whole community.

In summing up the First National Conference on Cardiovascular Diseases, jointly sponsored by the American Heart Association and the National Heart Institute in 1950, Dr. Abel Wolman of Johns Hopkins University expressed the significance of heart disease in terms of its positive meaning for the community and for cooperative action:

"What does this all mean? * * * First, it means that we cannot avoid coming to grips with this most dramatic group of diseases, most dramatic statistically or by any other measure; secondly, that we can develop a program for diagnosis, prevention, care, and cure, by the raising of the level of sights of every medical practitioner; by laboratory and other diagnostic techniques; by research; and by well-organized and active health departments and heart associations responsible for maintaining effective control and contact between the patient, the doctor, the nurse, the social worker, and all of the other contributors to social management; in general, in a community service that is intended to do only one thing—to convert the managed patient into an educated person. It is to make possible the return of a very significant number of people to normal activity in our society * * * to substitute a philosophy of hope among a large mass of people in this world for a philosophy of despair."

A summary description of the present status of the major types of heart disease follows:

Rheumatic Fever and Rheumatic Heart Disease

Rheumatic heart disease, the major heart disease arising in childhood, is caused by rheumatic fever. The cause of rheumatic fever is unknown, but an attack apparently follows an infection by a certain type of streptococcal germ (group A beta hemolytic streptococci). Rheumatic fever may inflame connective tissues widely throughout the body, but the heart is usually the only organ permanently affected. The disease has been called one that licks the joints and bites the heart. It is characteristic of rheumatic fever that one attack increases susceptibility to further attacks. Repeated attacks of rheumatic fever greatly increase the chances of serious heart damage. This damage is to the heart muscle itself or to one or more of the heart valves.

STATISTICS

Rheumatic fever almost always occurs between the ages of 5 and 15, and rarely do first attacks occur in those over 25. From 3 to 10 percent of cases of group A strep infection develop rheumatic fever. According to the Commission on Chronic Illness, more than 30,000 new cases of rehumatic fever arise each year, and approximately 750,000 Americans under the age of 50 have damaged hearts because of rheumatic fever. Nearly half (210,000) of the rejections for military service in World War II because of heart and blood vessel abnormalities

were due to rheumatic heart disease. In 1952, more than 21,000 persons died from rheumatic fever and rheumatic heart disease.

Statistics show that there is considerable variation in different parts of the country in the amount of rheumatic fever. The Middle Atlantic States and the Mountain States have the highest mortality rates, the East, North Central, and New England States are high, the Pacific States are lowest, and the South is generally low. There also seem to be family and hereditary factors involved, and a relationship to poor living conditions.

The outlook for the future is encouraging. Mortality from rheumatic fever and rheumatic heart disease is steadily going down. In 1935, the death rate per 100,000 population was nearly 16. In 1940, it was 13; in 1945 it was reduced to 11; and by 1950 it had dropped to below 7.

PREVENTION AND TREATMENT

Prevention.—Rheumatic heart disease can be prevented by preventing rheumatic fever. Rheumatic fever can be prevented by controlling the streptococcal illness which almost always precedes an attack. Streptococcal illness can be controlled by treatment with penicillin or sulfonamides.

Adequate and early treatment of strep infections with penicillin will prevent most first attacks of rheumatic fever. Individuals who have had an attack of rheumatic fever, and who are therefore particularly vulnerable to recurrences, can escape further attacks by taking penicillin or sulfadiazine regularly.

A recommended schedule of treatment to prevent rheumatic fever has been widely published in medical journals as part of a national prevention campaign started in January 1953, in which the American Heart Association and the National Heart Institute are cooperating. In this campaign, the objective is to prevent the disease by promoting (1) proper treatment of strep infections in all individuals and (2) prevention of strep infections in those individuals under the age of 18 who have had rheumatic fever or St. Vitus' dance and all those over 18 who have had an attack within 5 years. The program advocates that children who have had rheumatic fever continue daily prophylactic treatment at least until they reach 18, and that anyone over 18 continue treatment for at least 5 years from their last attack. If these treatment recommendations were widely followed, it is probable that in a very few years the number of new cases of rheumatic fever would be extremely low. Thus, the knowledge which could mean the virtual elimination of rheumatic heart disease in the future is at hand today.

Treatment.—There is no drug which will cure rheumatic fever. Complete bed rest is the prime treatment for active rheumatic fever, and this must be maintained until activity subsides. Adequate nutrition is very important. Salicylates such as aspirin, or the hormonal drugs, ACTH and cortisone, are effective in treating the usually short acute phase of the disease. Penicillin routine is begun at the end of the second week of the rheumatic fever attack to prevent new strep infections. Where the heart is seriously affected by the disease, resulting in cardiac insufficiency or failure, the giving of oxygen, the use of diuretics, and sometimes the administration of digitalis, may prove beneficial. Remedial surgery may later afford relief for many persons who develop rheumatic heart disease characterized by a defective mitral valve. A recent study has shown that there is only a 15 percent operative risk for persons properly selected for the mitral stenosis operation.

Because of the long duration of rheumatic fever, schooling and occupational therapy should be provided as soon as severe signs of the disease are over. Rehabilitation services, including guidance and training for sedentary occupations, are important for rheumatic heart disease patients who have suffered moderate to severe heart damage and whose cardiac reserve is low.

RESEARCH GOALS

The basic cause of rheumatic fever is unknown, the diagnosis difficult, the mechanisms of the disease are unclear, and there are no drugs which cure. The research approach, which has brought about the means of prevention, is concentrating on finding answers to many questions which may aid in solving these problems.

Among studies under way are investigations on the relationship of group A hemolytic streptococci to rheumatic fever, on the way the disease develops, on the conditions under which it develops, on the chemistry of connective tissue,

on the role of enzymes and enzyme inhibitors, on hereditary susceptibility, on hormone balance, on metabolism and nutrition, on development of compounds and drugs, on surgical techniques for correction of valve damage, and on the epidemiology of the disease. Recent research findings have shown that a treatment which combines cortisone or ACTH with a special diet and standard therapeutic measures can prevent permanent heart damage in a high percentage of children who have suffered a single attack of carditis, and that the extension of injury can be reduced in those whose hearts have already been damaged. In surgical research, an operation has been originated (and successfully used on human patients) whereby a plastic valve can be inserted in the main artery to prevent backflow of blood into the heart caused by an impaired aortic valve.

The facts known today place the matter of rheumatic fever in a position somewhat similar to that of the matter of nuclear fission several years ago when basic facts were known and it was a question of the need for concentrating great developmental resources upon the problem of producing an atom bomb. At the initiation of that endeavor it could not be predicted exactly how long a period would be required for physical research engineering to do the job. Nor can it be predicted today how long it will take for medical research engineering to do the job against rheumatic fever. We can be certain, given the resources to proceed, of the attainability of the goal, the conquest of rheumatic fever and rheumatic heart disease.

High Blood Pressure and Hypertensive Heart Disease

High blood pressure, or hypertension, is a disease—possibly systemic—directly affecting the blood vessels, from which the heart may ultimately suffer.

Each arteriole and artery of the body is made up of an inner lining, an elastic layer, a series of muscle layers, and an outside covering tissue. With sustained high blood pressure, a gradual thickening of the muscle layers occurs, followed by breaking up of the elastic layer. As the process continues, the passage becomes narrower. To keep the blood flowing at a normal rate against this increased resistance, the heart must perform extra work, as a result of which—like any muscle—it enlarges. This increased resistance may cause the heart to wear out prematurely or may cause kidney failure. Cerebral strokes or heart failure are frequently the end result of long-unabated pressure.

Since normal blood pressure readings are extremely variable, a diagnosis of high blood pressure requires not one but repeated examinations to assure the exclusion of temporary outside influences. The disease may be present for years without symptoms, but patients usually complain of fatigue, nervousness, dizziness, palpitation, insomnia, weakness, and headaches at some stage—all of which may be signs of this or other disorders. Blood pressure which is only moderately elevated is often a relative benign condition—especially in women—and may be tolerated well for decades.

High blood pressure usually progresses slowly. The course of the disease begins with moderate elevation, increases to a high stable elevation, and is accompanied by changes in the vessels of certain of the vital organs, usually the brain, eyes, and kidneys. Sometimes it is rapidly progressive—so-called malignant hypertension. In these instances the elevated pressure is a clearly demonstrated secondary factor caused by another disease condition, such as coarctation of the aorta, certain kinds of kidney disease, or a tumor or the suprarenal glands. This is secondary hypertension, due to a specific, determined cause. In the vast majority of cases, however, there is no determined cause to explain the increased pressure. This is called primary, or essential hypertension.

STATISTICS

Thirteen percent of the deaths from cardiovascular disease in the United States are definitely due to high blood pressure. Many more which cannot be strictly classified are attributable to hypertensive causes. An additional 30 percent of heart-disease deaths cannot be accurately classified as to whether they are due to arteriosclerosis or hypertension, but they are due to 1 of the 2, or both.

Of the estimated 10 million persons with some form of cardiovascular disease, fully 4,600,000 have high blood pressure. Of the young men examined by Selective Service during the years 1940–44, 165,000 were rejected because of high blood pressure.

Hypertension is far more common in females than in males, by a ratio of about 2 to 1. On the other hand, hypertension is less frequently fatal for women.

High blood pressure causes a progressively increasing amount of disability after middle life. Less than 1 percent experience disability at the age of 45, while at the age of 85 the incidence approaches 10 percent.

PREVENTION AND TREATMENT

There is no specific prevention or cure for essential hypertension as yet. Research may in the future bring knowledge of causes. Ultimately, there may be cures and preventive measures. But even today treatment from various directions is better than a decade ago and is improving as time goes on. Surgery, drugs, psychotherapy, and special diets have all been used with frequently, but not uniformly, encouraging results.

A wide variety of drugs have been used in hypertension, but many have been discarded as experience taught they had no particular lasting effect, or produced accompanying toxic effects. Drug treatment, however, continues to be regarded as one of the most important forms of therapy available at present. There are a number of drugs employed today for certain types of cases which give beneficial results, and these therapeutic agents are being continually improved as more knowledge of the body's chemistry, the action of the drugs, and other factors are learned from research.

Diet currently is considered under headings including: (1) Low salt, (2) low protein, and (3) low cholesterol diet, (4) low caloric diet, (5) rice diet. There is much evidence in favor of the usefulness of some of these and, though the final answers here have not as yet been found, there is much promising work under way in basic and clinical fields that is yielding information of value.

Contemporary surgical treatment consists of removal of a diseased kidney suspected of being the cause of hypertension, removal of an endocrine tumor, correction of coarctation of the aorta, or sympathectomy. Sympathectomies, nerve operations designed to reduce blood presure, are of two types: The total sympathectomy which aims to remove as many sympathetic ganglia as feasible (those nerves alongside the spinal column which are linked to the blood vessels of the large abdominal area), or partial sympathectomy which restricts the surgery to specific nerve areas. Each denervation differs in procedure, area, and response. The problem of the extent of these operations is far from settled, however, and no one knows for sure which areas to denervate or why differing responses occur.

There are many real ties between hypertension and emotional disturbances, and psychotherapy sometimes brings results as good as those obtained from any other form of treatment. In meeting this problem, the physician seeks to establish a mood of composure, self-possession, and reassurance. As a general rule he prescribes the good moderate life, individually adjusted to the patient's inner and outer needs—taking particular care to avoid unnecessary invalidism.

RESEARCH

Research has been active on a broad variety of studies. They are to elucidate physiological and chemical aspects including the renal (kidney), endocrine, and nervous control of blood pressure and their effects on the blood pressure. The problem of arteriosclerosis is indissolubly connected with hypertension and an interrelated multidiscipline approach is called for in their study.

Here are a few brief examples of work today:

The rice diet which has a beneficial effect in certain cases of hypertension has developed in recent years. Improvement of patients following this regime has often been marked and at times dramatic. The diet combines many of the characteristics of the low sodium, low protein, low cholesterol, low caloric diets. Rice, fruit, and sugar are the only foods allowed during the first 6 weeks of treatment. Many patients who are faithful to the diet show a definite reduction in blood pressure, an improvement of eye grounds, electrocardiogram, and heart size. Investigators are now attempting to determine the biological mechanism which brings about the favorable clinical effect in the rice and other diets with the goal of evolving diets that will find greater acceptance among patients.

A recent advance in the problem of sodium retention in the body has been the development of a plastic substance, a cation exchange resin, which when taken by mouth absorbs salt in the body. This substance (though it, too, has

disadvantages) will allow patients, presently on low sodium diets, to eat normal foods, since the sodium can be eliminated from the body with the resin.

Other studies are evaluating the varying types of sympathectomy (both total and partial) to determine the degrees of removal of nerves necessary, and methods for predicting in advance those patients who would benefit from the operation. One investigator is studying by anatomical and physiological means, the distribution of the sympathetic nerves commonly removed in sympathectomies.

The significance of hormones and glandular function as factors in high blood pressure are being investigated. One scientist, by removing a part, but not all, of the adrenal cortex (the outer shell of the adrenal glands which are on top of the kidneys) has been able to help a number of hypertensive patients. A marked drop in arterial pressure was noted, with relief from headache and shortness of breath. Findings such as these hold out hope that adrenal-cortex surgery may be an important development for hypertension sufferers—until some therapy based on correcting the as yet unknown cause is discovered.

The development of the new drug, hexamethonium, and its use alone and in combination with others, such as hydrazinophthalazine, give hope of effectiveness in reducing pressure for long periods in patients with hypertension, including critical types. Studies indicate that hexamethonium produces a more complete blockade of sympathetic nerve impulses than any other drug so far studied in humans. Successful management of severe hypertension was reported, including cases of malignant hypertension kept under control for periods ranging from 5 to 11 months.

The study of a number of chemical agents which have the ability to lower blood pressure has determined many of their inherent limitations. In addition to defining the limitation of existing drugs and evaluating their worth to determine the more superior ones, investigators are creating new compounds through synthesis which may have suitable biologic properties, and are seeking still other compounds from natural sources.

Research is under way which indicates that basic biochemical changes in the kidneys and blood stream may have an important bearing on the problem of hypertension. An approach has developed which involves the recognition of counteracting chemical systems that regulate blood elevation. These systems are normally in equilibrium. The present investigations concern those changes in the blood and in the kidneys that are traceable to an upset in this natural balance. Full understanding of this important area of investigation can be expected to yield useful information.

The goal of research in high blood pressure is to find the underlying mechanisms. While this ultimate goal is being sought, the research itself brings data on a wide front—answers and questions that arise from the very nature of progressing research. There are many minute paths to be explored, any one of which may lead to larger paths, perhaps to roads, perhaps to blind endings. Yet each lead must be searched out.

Thus there are many, and there will be increasing numbers of points of departure or embarkation. But the more science learns and knows, the better able its agents are to establish the subjects for investigation, and the hope is strong that before too long the treatment of hypertension will be based on understandable mechanisms.

Hardening of the Arteries and Arteriosclerotic Heart Disease

Along with high blood pressure—and often coexisting with it—hardening of the arteries is another major form of cardiovascular disease. Arteriosclerosis is the term that has been applied since 1830 to the common chronic arterial diseases of this nature, particularly of the hardening process in the great artery from the heart, the aorta. Today the term is used all inclusively, embracing atherosclerosis and a great variety of arterial changes.

This all inclusive term is used to describe secrious conditions as well as some of little consequence. An artery, for example, has three walls. Hardening of the middle wall is a common phenomenon of the aging process, but does not impede the flow of blood materially and consequently is of less importance.

The arteries themselves are a number of vessels through which the blood passes from the heart to the various parts of the body. They go out from the heart as branches from the trunk of a tree, becoming smaller until they terminate in tiny arterioles. Arteries are the lifeline of the body, since they carry the blood that is a necessary nutrient for the life of every part.

Trouble in this arterial system through the more serious forms of arteriosclerosis is the underlying cause of many afflictions and is the basis of coronary deaths, deaths from cerebral apoplexy, and many kidney deaths. If it involves the arteries leading to the brain, for instance, it may result in slow starvation of brain tissue and a degeneration of the intellect. This slow dying at the top due to arteriosclerosis of the brain is a distressing organic infirmity.

The disease at various sites may develop many pathologic facets. For example, arteriosclerosis of the aorta may be revealed as calcification, hemorrhage into a plaque, ulceration, narrowing and/or occlusion of the mouths of renal and iliac vessels, superimposed thrombosis, and subsequent embolism.

The major form of arteriosclerosis, and the form responsible for most of the damage that has been described, is called atherosclerosis, so named in 1906.

STATISTICS

Well over half of all fatalities from heart disease may be traced to atherosclerosis. It has been called the major disease of our era.

Nine out of ten times, heart attack is a result of atherosclerosis. About 300,000 people in the United States die each year from heart attacks, and many thousands more suffer less serious, but sometimes disabling, attacks. Much of this is premature death and disability. Fully two-thirds of all men about the age of 50 exhibit severe grade or coronary artery sclerosis at autopsy.

Atherosclerosis has been found present even in children as young as 3 years, or absent in octogenarians. This is the evidence that the disease is not necessarily an inevitable byproduct of the aging process.

PREVENTION AND TREATMENT

Current investigations of atherosclerosis and arteriosclerosis are uncovering new facets of the problems that cause medical authorities no longer to shrug this disease off as one of the indispensable penalties of living. Francis Bacon remarked that to brand a disease as incurable was to establish neglect and carelessness as if by law. The modern times have paraphrased this; for since the National Heart Act became law in 1948 perhaps no other area of a medical problem has been subject to such widespread, concerted attention, or worked upon so assiduously, and with such careful analytic technique. In spite of many hopeful approaches that may presage a significant breakthrough in this most significant front of attack, the cause of arteriorsclerosis is essentially unknown.

Association of obesity with arteriosclerosis is suspected and there is research evidence pointing in that direction. In the absence of further evidence from the studies that are underway, the conclusion has been reached by many investigators and clinicians that weight reduction may improve the prognosis in atherosclerotic heart disease.

It is well know that males in their fourth decade dominate over females of this age in their susceptibility to atherosclerosis. Recent experiments have shown that estrogen administration to cholesterol fed chicks inhibits coronary atherogenesis, without influencing aorta therogenesis, suggesting further research in effects of sex hormones on the disease. This is one but of many research approaches to the problem of prevention of the disease. Another, which is concerned with the relationship of fatty particles in the blood, will be discussed later.

Studies now underway may open up the possibility that a routine blood test can be developed to detect early the serious form of hardening of the arteries, and at the same time provide physicians with a blueprint for immediate action to counter defects in blood causing the condition. This possibility stems from research work on the role of heparin in the body's ability to handle fat.

Although there are no tests now generally applicable to screening and early detection of atherosclerosis, studies of serial electrocardiograms, and examination of various blood fractions using the ultracentrifuge, and sometimes employing a newly developed infrared light technique for identifying components, may make it possible in the future to identify the disease in a subclinical stage.

Secondary methods of prevention deal with the complications of atherosclerosis, such as thrombosis and occlusion, cardiac arrhythmias, cardiac enlargement, acute pulmonary edema, and cerebral atherosclerosis. Anticoagulants have been developed which prevent the extension of a thrombus, and investigations on the prophylactic values of these drugs are underway. Already anticoagulant therapy is saving many lives.

The diseases of peripheral blood vessels together cause a vast amount of disability, but physician education through programs of cardiovascular training is stimulating an appreciation of what can be done in the proper management of these diseases. Lay education programs regarding the importance of good foot hygiene, early and proper prenatal care, weight control, avoidance of constricting wearing apparel, and elimination of occupational equipment and work methods and habits that interfere with the circulation are cutting the toll in disability.

RESEARCH GOALS

It is a frequently expressed belief that atherosclerosis is caused by underlying metabolic defects which may themselves be primary or which may be secondary to disorders of the endocrine organs and which may be accentuated or retarded by dietary or nutritional factors.

An important lead that has excited much interest concerns the existence of certain constituents of blood plasma and their relationship to vascular damage in atherosclerosis. The researchers who made the discovery and other cooperating groups subsequently have been utilizing in exploration of this field the ultracentrifuge, a large instrument which whirls blood components or other study materials at a force 200,000 to 300,000 times that of gravity in order to separate them. By this technique was established the existence in the blood serum of man and animals of certain abnormal complexes of lipids and proteins, now referred to as lipoproteins.

Some evidence was obtained that certain of these lipoproteins have a definite relationship to the development of myocardial infarction. Studies in a number of places are further exploring possible relationships.

Research in other laboratories has been directed largely toward the acquisition of new methods that will permit a more searching approach to the entire problem of atherosclerosis. Chemical methods have been developed for the estimation of naturally occurring serine, ethanolamine, and choline, which enter into the molecular structure of the phospholipids. By their use in a definite study of the several types of phospholipids, it should become possible to determine the extent to which all phospholipids subserve a single general function or the extent to which each plays a unique role in a body metabolism. Other studies, utilizing a number of enzyme systems and isolated metabolic fragments of molecules, are aimed at an elucidation of the metabolic transformations of cholesterol, the fatty substance present in the lesions found in atherosclerosis.

Of particular interest is the development by investigators of a clearing-factor, so-called because by its effect upon the state of fat in the blood liquid, it has the ability to clear the milky condition of the blood. Of greater significance, however, is its ability to alter that portion of fat which combines with protein in such a physical state as perhaps to foster deposit of fat in the arterial wall.

For some 10 years it has been known that the turbidity of serum, due to fat globules present after a meal, could be reduced, or cleared, by the chemical heparin or similar compounds. Study has revealed that it is not heparin itself, but an enzyme-like material which can be formed from a precursor among the serum proteins, by certain tissues (heart, lung), in the presence of heparin.

Some major problems occupying many research scientists in this one area of the study of atherosclerosis are:

1. Which fatty particles in the blood are actually related to atherosclerosis?
2. Is this association a cause of the disease or a result of it?
3. Can these abnormal lipids in the blood provide evidence of existent or developing heart disease?
4. If a medicine could be developed to clear the blood of these fatty particles, would it be therapeutic or prophylactic?

In this one area of atherosclerosis research, a single scientist or a team of workers somewhere in the world may open an avenue of investigations that will develop into a way for great numbers of people to escape from the slavery of disability and the tragedy of untimely death. It is a strategic area, and interpretative of the statement sometimes made that because heart disease is widely prevalent and essentially unexplored, and because there are sound reasons to believe that important solutions to certain problems may be discovered reasonably soon, research in the cardiovascular area probably offers the greatest challenge of all chronic illnesses.

Since atherosclerosis is responsible for 9 out of 10 heart attacks, investigations aimed at coronary attacks are another facet of arteriosclerosis research. Several years ago a substance known as dicumarol was discovered to retard the clotting

of blood if administered by mouth. There were reasons to believe that if this were given immediately after a "heart attack" the immediate outlook and the incidence of complications might be favorably affected. The results in small groups of patients seemed encouraging.

Then, under the auspices of the American Heart Association and with the financial support of the Public Health Service, a cooperative study was carried on in 16 hospitals in 10 cities scattered from Boston to San Francisco. A thousand patients who had suffered heart attacks were treated according to a careful plan, with half receiving dicumarol daily, and the other half receiving none. The study showed that the agent was of benefit and could save and prolong lives. The answer to a vital question was thus obtained in less than 2 years by this cooperative study, whereas 1 team working alone would have taken perhaps an entire decade to secure the same information.

Further investigations of dicumarol and other anticlotting agents have been continuing in a number of laboratories. The therapeutic success caused a need for more research to improve and keep on improving on these drugs until their ultimate potentialities are completely realized.

As a result of research, requirements for a better anticoagulant have been set up. It can be of the dicumarol type, but must be characterized by greater reproducibility of therapeutic effect; it must be absorbed completely and have stability of biological effect while in the body. Another type of suitable anticoagulant would have the general properties of heparin, but would be more stable in the body, possess a longer duration of activity, have a wider spread between effective and dangerous dosage, and be obtainable through organic synthesis. Work in progress is directed to the development of such an agent, which would not only be of benefit in the therapy of cardiovascular diseases, but would also facilitate many of the problems of surgery, particularly on a mass scale.

Other Types of Heart Disease

Less than 10 percent of the deaths each year from diseases of the heart and circulation (heart disease) are caused by the remainder of the more than 20 types of heart disease.

These many other forms do, however, indicate the complexity and range of the total problem of heart disease. Both in terms of numbers of persons whom they strike and of human and economic losses, too, they are of very real importance. They account for some 30,000 deaths each year. They cause great disability in many of those whom they afflict. They impose a heavy burden in expense and care.

The current state of knowledge and its application in several of these types of heart disease are particularly of interest because against them the greatest advances have been made. The fact that they are ranked today among the less important types of heart disease is evidence that they have been reduced in rank by the benefits of research and its application. For example:

Syphilitic heart disease and aneurysm of the aorta are disappearing; they are rare today owing both to early diagnosis and proper treatment of the original syphilis infection and to better treatment of aoritis (involvment of the heart's great artery) when it is discovered. Twenty years ago syphilis was one of the major causes of heart disease.

Hyperthyroid heart disease or thyrotoxic heart disease is practically extinct because of early recognition and proper treatment of the condition—toxic goiter.

Subacute bacterial endorcarditis, a complication of rheumatic heart disease and congenital heart disease, has been reduced within 10 years from a mortality of 99 percent to a point where it is curable in from 80 to 90 percent of all cases; the antibiotics, aided by better diagnosis and other measures evolved from research, have made this conquest possible.

Diphtheritic heart disease and fatalities from it, once far from rare, have decreased almost to the vanishing point.

Congential heart disease was not many years ago considered a hopeless condition. Today, much can be done to help those afflicted lead a normal life.

It has recently been said that probably half of those with congenital heart defects now seen can be either completely cured surgically or much benefited * * * and that more progress has been made in the understanding of the significance of congenital malformations and in their recognition than in any other type of heart disease.

In view of this, a brief summary of congenital heart disease serves to highlight the fact that many kinds of accomplishments have been made in the range of the less common or "minor" heart diseases.

CONGENITAL HEART DISEASE

Congential heart disease is caused by a heart or blood vessel imperfectly formed before birth; there are more than a dozen types of these defects which are presently diagnosable. Sometimes the defect is so severe that the newborn can live for only a short time. Sometimes it is so mild that it is not recognized during a long lifetime.

STATISTICS

Although only a very small fraction of all children born come into the world with such malformations, this kind of heart disease still accounts for a substantial amount of disability and death. In the United States each year, some 8,000–9,000 lives are lost from this cause. In 1948, it accounted for the death of 7,300 babies under 1 year of age, another 500 under 5 years, and 575 children between the ages of 5 and 25.

PREVENTION AND TREATMENT

Not long ago, heart disease present at birth was considered unpreventable and incurable. Today there is not only some knowledge of and means for prevention, but also the march of progress in surgery is continuing to make possible correction and benefiting of more and more of the various types of defects.

In the light of present knowledge, primary prevention centers on protecting the mother. Research has disclosed evidence that virus infections during pregnancy, particularly German measles, vitamin deficiencies, metabolic and endocrine disturbances, and radiation are possible malformation causes when present during the first 3 months of pregnancy. This suggests, among others, such measures for protecting the mother as avoidance or treatment of viral infections during early pregnancy, good diet with supplementary vitamins, avoidance of excessive radiation, and proper management of metabolic and endocrine disturbances.

Secondary prevention—aimed against complications developing after birth—involves treatment of the infant or child. The complications of congenital malformations are subacute bacterial endocarditis and cerebral thrombosis. The former can be prevented through the prophylactic use of antobiotics or the sulfonamides prior to and following operative procedures, such as tonsillectomies, dentistry, etc. Cerebral thrombosis can be prevented by preventing dehydration for all cyanotic (blue coloration) patients.

Although no specific screening test for early detection is available, chest X-ray surveys, especially in preschool and school children, can help to detect cases in the subclinical stage—before manifestations become apparent to outward appearance.

Treatment is the area in which much good news is being made daily in hospitals and clinics in many parts of the country. Because of recent advances, surgery can now restore to a normal or nearly normal life many children who would have been marked for invalidism or death had they been born 15 or 20 years ago. At least half of the types of malformations can be surgically benefited, and almost every one of the others may be added to the list in the near future as research goes on.

Further, there has been a spreading of knowledge of the surgical techniques necessary to perform the complicated, difficult operative procedures. Formerly, only in a few great medical centers could they be carried out. Now, in almost every part of the country there are places where congenital heart surgery is being done with great skill and success. Up-to-date diagnostic information has also been spread more widely in recent years, through courses and clinics for physicians sponsored cooperatively by medical societies, heart associations, health departments, medical schools, and teaching hospitals—so that more and more doctors are becoming better and better trained in recognizing the infant or child with congenital heart disease. Heart-disease programs are aiding in the providing of facilities for identifying those with congenital heart disease and in referral to appropriate centers for precise diagnosis and possible surgical treatment. The program of the Children's Bureau of the United States Department of Health, Education, and Welfare for regional centers is an important resource, as is the utilizing of cooperatively sponsored vocational rehabilitation facilities aided federally through the Office of Vocational Re-

habilitation of the Department—in the case, for example, of a young adult with a congenital defect which has made him unemployable and which, if corrected, will mean his return to employability.

Since the first successful operation for a congenital defect in 1938, tremendous strides have been made in surgical treatment. The "blue-baby" operation, originated in 1944, has allowed many patients to live much longer and happier lives. Looking backward from 1953, it can be said that literally thousands of operations upon at least six or more of the various types of malformations have been successfully performed—and that current research in surgery and its allied sciences such as physiology are widening the potentialities still further.

RESEARCH

Techniques have been developed, are being constantly improved, and have begun to be successfully used on human patients after long animal experimentation to close holes in the septum or partition which separates the two sides of the heart. Plastic buttons have been devised which, successful in animal experiments, promise to be effective for repairing imperfections in the partitions of the heart. "Deep-freeze" methods of obtaining a bloodless field during heart operations have been developed. Blood-vessel grafting, an area of remarkable development in the past few years, makes possible the remedial treatment of some congenital defects; it is now possible to graft pieces of artery of considerable length. The mechanical heart made medical history in 1952; several types of these machines are in advanced stages of development and with continued improvement it is anticipated that a dependable and satisfactory instrument for clinical use in a number of areas of surgery will be forthcoming.

Basic studies in many fields, physiology, biology, anatomy, biochemistry, and others will widen still more the range of knowledge. Research's goals in the field of congenital heart disease are, for example, the uncovering of facts on the causes through the study of the physiology of the developing embryo, the influence of genetic factors, and the mechanism of virus infections.

The accumulating evidence of the significant role that communicable disease in the mother plays in the child's being born with a heart defect suggests perhaps the greatest potential public health aspect of the disease and underlines the need for determining, through research in medical and allied sciences (such as epidemiology particularly) the full role of communicable infections and other factors. If the factors can be fully known and established and can be demonstrated to be preventable by public health measures, then communities can mount a far stronger attack upon the implicated communicable diseases and other factors and, in preventing or controlling them, get at the agents which disturb normal prenatal development and cause congenital malformations.

The National Heart Institute Program

The National Heart Act was enacted by the Congress in 1948 to support research and training in diseases of the heart and circulation, and to aid the States in the development of community programs for the control of these disesases. This act, which created the National Heart Institute, authorized the Public Health Service to lannch the first comprehensive Government attack on heart disease.

The Heart Institute—established as a division of the National Institutes of Health, the principal research branch of the Public Health Service—leads and coordinates the heart program of the Service. This program has two objectives: (1) To find new and better ways of preventing, diagnosing, treating, and curing heart disease, and (2) to see that what is already known is applied to reduce death, disability, and suffering caused by heart disease. The Heart Institute directly administers programs of research and support of research and training. It provides technical services and, through its Director serves as the focal point for the total heart program, which includes activities, administered by the Bureau of State Services, for assisting the development of control programs in the States and Territories.

RESEARCH

Basic and clinical research.—The program of research conducted by the National Heart Institute is to increase fundamental and clinical knowledge of the underlying disease processes affecting the heart and circulatory system, and

toward evolving information which will permit the prevention or amelioration of these diseases. Research activities are concerned with the total cardiovascular system, the kidney, and the endocrinological and nervous factors which control these organ systems; disease states, and their etiological agents, which are important factors, in the development of cardiovascular and renal disease; and gerontology.

The organization of the Institute's research is on three levels. Laboratory studies are conducted in chemical pharmacology, the chemistry of natural products, and cellular physiology. Combined laboratory-clinical work is in five areas: cardiovascular hemodynamics, kidney, and electrolyte metabolism, general metabolism, physiology and pharmacology of the autonomic nervous system, and technical development of diagnostic instruments. Clinical investigations at present are carried on in general medicine and experimental therapeutics, in surgery, and in gerontology.

Many notable research achievements have been made. Advances in basic knowledge include the finding that the liver plays a role in controlling the partial contraction of small blood vessels which is essential for maintaining normal blood pressure; the confirmation through experimental animal preparations that the kidney and the endocrine glands controlling it are of great importance in the development of heart failure; and the discovery that there exists in the body a system of several chemical parts, a deficiency of any part of which may adversely affect fat metabolism and thereby foster hardening of the arteries.

Among accomplishments resulting in improved therapy has been the development of a powerful new drug, procaine amide, which has the ability to abolish the irregular heart rhythms which frequently prove fatal in patients recovering from coronary attacks and in persons under anesthesia during operations. Another advance has been the development of a truly short-acting intravenous anesthetic which may be effective in reducing the hazards of surgery now experienced by elderly patients. Further significant contributions have been the determination of the limitations of drugs used to prevent the growth or formation of blood clots and establishing criteria for a better anticlotting agent; the development of the electrokymograph—the instrument which records heart border movements—as a diagnostic and research tool; and the synthesis of a number of compounds for study of their actions on the cardiovascular system.

During the current fiscal year, $2,986,000 has been earmarked for research conducted by the Institute. A number of studies in progress are directed toward developing new therapeutic agents and toward furthering understanding of the action of existing cardiovascular drugs. Of particular interest are studies of compounds which possess the ability to block the destruction of drugs in the body. Such compounds, derivatives of a substance known as SKF 525, prolong the action of many drugs, including the barbiturates and analgesics. Several of these inhibitory agents have been synthesized, and their possible therapeutic value is now being investigated. Clinical study in the past year of another remarkable drug, phenylbutazone, indicates that it exerts powerful antirheumatic effects comparable to those of cortisone and ACTH, although it produces many serious side reactions. Because of the encouraging results experienced, however, investigations are going forward on other synthetic nonsteroidal compounds which may exert a local tissue effect without imposing major hormonal imbalances.

Work with natural products is chiefly concerned with the isolation from plant sources of substances which affect the cardiovascular system, and with the synthesis of compounds with blood-pressure-lowering action. Plant materials under study come from many parts of the world, including South Africa, Cuba, and the West Indies, and South America. One substance has been isolated from leaves of *Rhododendron maximum*, obtained in West Virginia and North Carolina, which in very small quantities produces a marked lowering of blood pressure. The structure of this material is now under intensive chemical investigation.

Studies in metabolism are concentrating on mechanisms of lipid transport, an area of great importance to the understanding of atherosclerosis. This work continues the investigations which earlier resulted in the delineation of a biochemical system in the body, involving at least five components related to control of the level of abnormal fatty molecules in the blood. Assay methods have been developed for determining quantities or activities of the components, and a number of patients are being assayed for the content of these "clearing factor" components in their plasma.

One of the problems under investigation in kidney and electrolyte metabolism concerns the mechanism of edema formation in cardiac failure. It is not clear why the kidney is unable to respond to fluid accumulation by increasing the rate of excretion of salt and water, nor is the role of the adrenals and other endocrine glands established. The development of a technique for producing the congestive heart failure syndrome in dogs has provided a means whereby these and other questions may be investigated.

Among the principal clinical studies under way is an investigation of essential hypertension. Patients are being studies to further classify their disease and some of the newer therapeutic agents will be tried to study patient response. A study of surgical interest is concerned with the diagnosis of intra-auricular septal defects. Preliminary animal work has indicated that the nitrous oxide technique has many advantages over oxygen methods, and it is anticipated that the new technique will be soon subjected to critical trial in appropriate cases.

Epidemiological research.—Much knowledge of heart disease can be gained by studying an average community over a period of time to find out how many people have it, what types they have, at what ages it develops, and what factors seem to be associated with it. Such a study is being conducted by the Heart Institute at Framingham, Mass., in cooperation with the town's health department and physicians and the State department of health and medical society.

About two-thirds of the adults in this community between the ages of 30 and 60 have been given a thorough physical examination to determine whether or not they have arteriosclerotic or hypertensive heart disease. Persons in the study will be given followup examinations every 2 years to accumulate data on how heart disease develops.

This approach is expected to produce a number of significant results. It may provide definite information as to which factors or characteristics are present in people who develop heart disease. A byproduct of the study will be the accumulation of data on incidence and prevalence. A further result will be an appraisal of the value and efficiency of various methods and procedures for diagnosing heart disease.

Biometric research.—In statistical research of the Institute, data on heart disease mortality and morbidity in various segments of the population are being collected and analyzed. Also, studies, which have important bearing on both the research and control programs are being carried on to furnish a factual basis for planning and conducting heart-disease activities. Consultation and assistance is also supplied, within and without the Institute, in planning of research projects which involve complex statistical techniques or extensive statistical processing.

Grants for research.—Heart-disease research in universities and hospitals all over the country is being fostered and supported by the Heart Institute, through research grants. Under this program, funds are granted to individual scientists for carrying out important heart-disease projects. These grants are making it possible for institutions to expand their existing heart research activities, to undertake new studies, and to conduct investigations in neglected areas in the cardiovascular field. In effect, the program is serving to enlist non-Government facilities and scientists in the research attack.

The stimulation given by the grant program has significantly raised the level of heart research. During the fiscal years 1949–53, a total of 1,784 grants were made for research projects, amounting to $20,262,298 in research support. For the current fiscal year, $6,843,000 has been allotted for making research grants. These sums represent research progress that could not otherwise have been made, since the program supports only projects for which institutional funds are not adequate. It does not take the place of support from foundations, private philanthropy, or voluntary health organizations.

Promising investigations are being supported in all areas of heart disease. Major emphasis is being placed on problems of high blood pressure, hardening of the arteries, heart failure, surgery, and the physiology of the cardiovascular system. Among the most fruitful of the studies being conducted are those concerned with the role of cholesterol in the development of arteriosclerosis, the hereditary and environmental factors related to cardiovascular disorders, the evaluation of dietary factors in hypertension, new surgical procedures, development of the artificial heart, exploration of renal function, and the therapeutic use of new drugs and hormonal substances such as ACTH and cortisone.

Research construction grants.—Existing research laboratories are extremely crowded and the expansion of heart and blood-vessel investigations throughout the country is limited because of lack of suitable space. Some impetus was

given the research attack on heart disease in 1950 through Heart Institute grants for construction of additional vitally needed research facilities. Grants totaling slightly more than $6 million were made to 26 institutions located in 17 States.

These grants made possible the strengthening and enlarging of a number of established research centers, as well as giving material assistance to some institutions just beginning heart-research activities. No grants have been made since 1950 as funds were not available for this purpose.

TRAINING

Research fellowships.—There is a shortage of skilled investigators devoting their talents to the cardiovascular diseases. Also, researchers already trained in some field or fields need additional skills to increase their competency. The research-fellowships program is helping to relieve this dual scarcity by offering encouragement and assistance to some of the most brilliant and promising minds to enter upon a research career in the heart-disease field. At present, two types of fellowships are awarded: postdoctorate fellowships for those with a doctor's degree, and special fellowships for doctors and others who have demonstrated exceptional competence or unusual ability. The term of a fellowship is usually for 1 year, and the amount of the stipend given depends on the type of award. A fellow may conduct his work at any institution where interests and facilities are suitable for the type of research he plans to do.

In its first 5 years, the National Heart Institute awarded 422 fellowships, with training stipends amounting to $1,380,290. The amount which has been appropriated for this purpose for the current fiscal year is $580,000.

Clinical traineeships.—The number of cardiologists and heart specialists in active practice today is far too low compared with the amount of heart disease in the Nation. The Institute's traineeship program provides a means of partly meeting the need for more clinical personnel specializing in heart and blood-vessel diseases.

Traineeships are available to doctors under 40 years of age who have completed a year's general internship and an additional year of training and experience. Since their purpose is to improve the competency of physicians in the diagnosis, prevention, and treatment of heart disease, they may be carried out at any institution where well-rounded cardiovascular training is given.

Traineeships given during the 1949–53 fiscal period numbered 232, with stipends totaling $771,495. For the current fiscal year, $400,000 is available for the program.

Teaching grants.—It is important that medical schools have strong and up-to-date courses of instruction in the cardiovascular diseases, so that medical students may be well-equipped with the most recent knowledge in this field. This is particularly essential because of the rapid and marked advances that are being made in researh.

The program of teahing grants-in-aid is making it possible for medical schools to coordinate and improve their teaching of heart-disease subjects and to place adequate emphasis on the cardiovascular field. Institutions are not restricted to a rigid plan in developing their teaching programs, and the funds are utilized in varying ways by different schools. The grants are approved for a 1-year period, but may be renewed annually from appropriated funds.

Two hundred and forty-five teaching grants, amounting to $3,608,819, were made by the Heart Institute in its first 5 years. During this period grants were made on the basis of a maximum of $14,000 to 4-year medical schools and $8,000 to 2-year schools. These have now been increased to $25,000 for 4-year schools and $15,000 for 2-year school; $2,682,000 is available for the current fiscal year.

HEART DISEASE CONTROL

The purpose of control activities is to bring about, through public-health techniques, the widest possible application of methods and measures which have been proven to be effective in finding, preventing, diagnosing, and treating heart disease. Application of existing knowledge can considerably reduce death, disability, and suffering from heart ailments. Funds for conducting control activities are provided in the annual appropriation of the National Heart Institute, and are administered by the Bureau of State Services of the Public Health Service.

Grants to States.—Grants-in-aid are made to the States and Territories to assist them in developing community programs for controlling heart disease.

The grants are made according to a formula based on the population and economic needs of the State. Each State is required to match each $2 of Federal money with $1 of its own money. Federal money available for such grants in the current fiscal year is $1,125,000.

Grants help State and local health departments to employ and train staffs to find and refer heart-disease cases to private physicians for diagnosis and treatment; to furnish follow-up services in the home; to provide training opportunities to physicians and public-health workers; and in other ways to aid in restoring those with heart disease to near-normal life and useful activity. Generally, State plans include provision for several of the following: Medical direction, professional and lay education, clinic improvement, public-health nursing services, and medical social services.

Technical assistance.—Assistance is also given the States by providing information on technical matters relating to control. Knowledge and experience which is gained in conducting pilot studies and demonstrations is made available. One of the activities in this connection is cooperation with tuberculosis surveys so that chest plates taken to discover tuberculosis are also examined for possible indications of heart disease. Another activity is promoting the safe use of drugs which prevent blood clots, and important and frequently life-saving treatment for many persons suffering heart attacks. Use of these drugs requires accurate laboratory control by persons trained in the technique of quickly determining blood-clotting time. The training of such technicians is being aided by teams which move from State to State, providing instruction in the essential laboratory procedures.

INFORMATION AND EDUCATION

The importance of widely disseminating information on all aspects of heart disease was recognized by Congress, which included a specific provision in the National Heart Act to "establish an information center on research, prevention, diagnosis, and treatment of heart diseases, and collect and make available, through publications and other appropriate means, information as to, and the practical application of, research and other activities."

A steadily developing program of professional and public information is being carried out. Activities include the preparation and distribution of heart-disease information-education articles, leaflets, pamphlets, reports, and other publications; planning and development of audiovisual materials, exhibits, radio and television broadcasts and transcriptions; maintenance of an inquiry and reference service; and cooperation with other agencies and organizations in planning and executing informational and educational projects on diseases of the heart and blood vessels.

COOPERATION

The total Public Health Service heart program is administered as the Federal Government's participation in a national collaborative undertaking against heart disease, joining the partnership of all interests in the cardiovascular field. The National Heart Institute has close working relationships with the American Heart Association, State health departments, foundations, medical schools, universities, hospitals, and other agencies and institutions actively concerned with heart disease. This cooperation with other organizations is resulting in avoidance of unnecessary duplication, in defining suitable spheres of operation, and the formulation of programs to achieve overall objectives most effectively. It is also resulting in a truly united front in the attack on heart disease.

The Outlook

The major cause of death, even before old age comes, is heart disease. It accounted, in 1947, for 8.6 percent of the deaths from all causes in the age group, 5 to 19; for 11.4 percent in the ages, 20 to 34; and 35.3 percent of the deaths of those 35 to 54 years of age. In the ages 55 and above, of course, the percentages were far higher, heart disease causing 54.7 percent of the deaths in this group. For all age groups combined, heart deaths accounted in 1947 for 43.3 percent of the deaths from all causes. This year heart disease will cause more than three-quarters of a million deaths—more than 1 out of 2 of all deaths in the United States.

The importance of cardiovascular diseases as a cause of death prior to old age emphasizes the fact that the major need of today is the discovery of ways

both of preventing heart disease and also of finding and treating the disease in stages earlier than those in which we now find and treat it.

It is in the therapy of damage—the treating of existing disease—that the chief medical advances against high blood pressure and the consequences of hardening of the arteries have heretofore been made. Still more benefits for the already-damaged heart and blood vessels will undoubtedly be developed.

But it is from the seeking out of the underlying factors behind the rheumatic, the hypertensive, and the coronary diseases, which account for a vast majority of the deaths from heart ailments, that the greatest dividends will eventually come.

In writing of the fundamental importance of seeking understanding of the mechanisms of heart disease, Dr. Paul White says:[1]

"It is in this direction that attention and support in research by both private and public enterprise should certainly have the utmost priority, since the sooner we understand the causes of diseases, the sooner we can control them and, by reduction of their prevalence, cut down the present heavy need for hospitalization for elaborate study and often prolonged treatment.

"* * * it is evident that the sooner we discover and thereby learn to prevent the underlying causes of heart disease, the sooner we shall rescue our young people and middle-aged population from cardiac invalidism and death, and the less effort, time, and money we shall need to plan for and expend in their care. An increasing mortality from heart disease per se in the years to come need cause no alarm, in fact, such may be welcomed provided death comes quickly, comfortably, and quietly while at rest in bed or easy chair at an advanced age, say 90, after a long and happy and useful life."

Once any of the presently unknown causes underlying these three is discovered, a great deal will have been accomplished. Of course, progress in the control of heart disease in one or all of the three great brackets may be made through the extensive and intensive application of partial measures which have emerged or are emerging almost daily from the laboratory. But medicine's most complete conquests over disease are largely embodied in the history of the discovery of specific or contributory causes of diseases: the greater benefits almost always await such discovery. Here, then, is the hardest core of the problem.

Scientific research is the method to get at this core, and there is agreement among medical, scientific, and public health authorities that wide, intensive, prolonged, and collaborative investigation, by competent investigators who can devote adequate time and energies to the task, is the paramount factor in developing the nationwide heart program. This research, it is also felt, can best be done in an atmosphere of freedom without regimentation and with support from diversified sources rather than from a completely centralized resource.

Results of such research may arise from a modest laboratory where a single scientist makes a discovery for which hundreds of others in great laboratories have been seeking. Or results may come from a large group of workers of which each subgroup concentrates its efforts, in accord with its specialized interest and training, upon one or more aspects of a problem. Both kinds of endeavor, of the individual and of cooperating groups, must be supported and encouraged in any comprehensive and adequate research program. The fields of research from which discoveries of benefit for the heart may come are, moreover, not merely those in which lie the primarily cardiovascular investigations. They may arise from other areas of general medical or basic scientific research, and intelligent support does not circumscribe itself too narrowly. Furthermore, in the United States, with a population becoming increasingly aged, heart and circulatory disease must be considered to a very important degree in their gerontological aspects. Thus, research should seek for basic understanding not only of heart disease problems but also of appropriately related gerontological problems. The sum of the aging problem is not made up of cardiovascular disease problems, but there is a significant relationship, and this relationship is to be taken into account in the development of research programs.

Although the further knowledges that research much provide are highly important, there is much that can be done today in the way of establishing and improving the application of what is known already. This has been stated[2] with wise caution by Dr. Paul White: "Some things we have learned which can be applied at once through community effort, but we must take care at the same

[1] Heart Disease (fourth edition); the MacMillan Co., publishers.

[2] White, Paul D.: Recent Advances in the Medical Treatment of Heart Diseases. Bulletin of the New York Academy of Medicine, August 1947, second series, vol. 23, No. 8, pp. 441–453.

time not to delude ourselves and others with false enthusiasm based on the frequency of heart diseases alone and on the idea that we can at once institute a campaign to control them all."

Fortunately, there is today large sympathy for and a growing understanding of the needs of disease-control activities as well as research and of other problems in the national heart program. Realization of the public-health importance of heart diseases has crystallized in the last few years among the public and physicians and scientists. Today there are active associations, both of medical and of public members, with years of solid groundwork upon which to base the programs which are needed.

The healthy development of the American Heart Association as a strong national voluntary health agency is a striking demonstration of the fact that the United States has embarked upon a comprehensive attack upon heart diseases. Once a small scientific organization, the American Heart Association reorganized and reoriented a few years ago and today includes a large and increasing number of lay people in its membership and on its governing bodies. With its growing number of local affiliates and the expanding programs of research, education, and community service which the national and local heart groups furnish, it forms a nationwide network of voluntary health structures. Integrated with official structures, in particular the public-health departments, and with the medical profession through its societies throughout the country, there is provided the partnership of interests indispensable to the success of a great undertaking against heart disease.

The observance of the collaborative principle on the part of the groups interested in the cardiovascular disease problem is significant. Coordination is being achieved by the various agencies through the interchange of information and by a truly cooperative spirit. The American Heart Association and its affiliates, other interested voluntary organizations, foundations, and privately financed groups, mutually share the responsibilities with public agencies. An exemplification of this is particularly evidenced in the close working relationships between the American Heart Association and the National Heart Institute. The collaboration is not passive, but active and positive.

The National Heart Institute's existence and place in this partnership is another manifestation of the crystallized recognition of the importance of heart diseases. The National Heart Institute and its program also mark acceptance by the Federal Government of its responsibility in this problem.

Thus has been supplied the structure and the authority for vitally needed Federal support added to the efforts of those who have long been working toward a great national endeavor against heart diseases. Such a combination of forces, voluntary and official agencies in teamwork, has been characterized by many leaders in the heart disease field as an ideal arrangement which provides the best way to achieving the conquest of heart disease. Thus the administrative machinery, both Federal and non-Federal, is well founded, organized, and functioning cooperatively.

Although research is necessarily stressed, the need for the application of knowledge must also be emphasized. Medical research supported by agencies such as the National Heart Institute and American Heart Association has its reason for being the finding out of facts which can be applied for the common good. That there be as short a lag as possible between valid new findings and their application—and that existing knowledges be widely and well applied—is a responsibility to which all those concerned in the nationwide heart program are giving most serious attention.

The eventual goal is, simply expressed, the prevention of heart diseases. Consequent upon this would be their reduction as the major cause of death before advanced old age, and the extension, as far as possible, of human life and health for both old and young through healthier hearts and circulatory systems. Toward this achievement is directed the attack upon the Nation's leading killer and great public-health problem.

RESEARCH STUDIES

At once the pace, the depth, and the range of the total heart research attack are keyed not only to personnel but also to available facilities and funds which stimulate research as well as provide the means with which to do research. In the past, heart research did not proceed as it profitably, from the standpoint of the increment of knowledge, might have done.

The mobilizing, strengthening, and expanding of America's resources in heart research which began only a few years ago has since that time resulted in perhaps the most promising advances seen in any of the major chronic illness fields.

This has meant that the Nation was no longer postponing, but, in a very real sense, was providing itself with medical benefits to be realized in the foreseeable future. The Nation is making up for the lean years of insufficient interest and support.

Scientific publications ranging from clearly clinical reports of new or improved therapies to very fundamental reports in basic fields portray to the research and medical world the advancement of knowledge that has accrued through the programs of heart research support, public and private, although these programs have been in operation to a sizable degree hardly 5 years. A complete list of these accomplishments, represented in the published findings of the scientists, would show a tremendous range of basic and clinical progress along the whole frontier of heart disease and would require volumes merely to list.

Perhaps not a great deal of this progress reported in professional journals has apparent significance. The headlines and stories in the press, the encouraging articles in popular magazines, and the reports of television and radio hailing the achievements of heart research have, though perhaps overemphasizing advances in some instances, provided some public interpretation of this progress.

A fundamental observation in the field of cellular physiology, which may well not today be related to a predictive test for premature hardening of the arteries has nevertheless a future potential. Research has been called guerrilla warfare against the unknown, and its forages and attacks are often remote and difficult to assess tactically. Particularly is this true of the more basic research.

To assay the new information added in the past few years as a result of the expanded nationwide research attack and with certainty to announce or predict its ultimate significance is not possible. Retrospect provides the truest evaluation; today, for example, it is possible to trace back to years ago the developments in related fields, such as physiology, which helped make possible current striking achievements in heart surgery. A seemingly small discovery of today or last year may provide a clue or become a turning point which leads to the development of preventative measures for atherosclerosis, the form of hardening of the arteries which eventuates in many coronary heart attacks.

It can be said, despite the unpredicability of the pieces of information which science must slowly but surely fit into patterns, that the programs of support for heart research in the past 5 years have resulted in stepping up its pace, in widening and deepening it, and in bringing ever nearer the day when untimely death and long-term suffering from heart disease will be drastically reduced.

RESEARCH TRAINING

When the Nation's resources against heart disease began to be strongly mobilized a few years ago, it was said that the first and greatest need was for additional trained and capable men and women, particularly in scientific fields because research offered the paramount hope for the conquest of heart disease. This need, like others, has had concerted and cooperative effort directed toward it since that time, by such organizations as the American Heart Association and its affiliates, foundations, and other private organizations, and the National Heart Institute.

It is however, a continuing need. Efficient, trained researchers are too few in number not only in the special field of heart disease but also in basic disciplines like physics, chemistry, biology, physiology, and so on, from which come scientific knowledge of fundamental importance.

The progress to date in research training is encouraging. Though perhaps not large in terms of numbers, a new and more highly trained group of younger scientists is being added to the Nation's research potential at a time when there is critical need and demand for such personnel on almost all scientific fronts. The programs for research training throughout the country are increasing the caliber of research workers in medical and allied fields. Not only is this true because of direct support given to men and women, as research fellows, to permit and stimulate them to enter into and remain in research work. It has also been helped, indirectly, by the programs of support, like the National Heart Institute research-projects grants, for research studies. For the assistants and technicians who work with and help the scientists directing an investigation also, by learning while doing, receive a not inconsiderable research training.

It is, further, worth noting that the programs for research fellowships and research training are resulting in definite research advances, additions to our knowledge of heart disease, emanating from work done as a part of the research training itself. Examples of this appear frequently in medical and scientific journals in reports of studies authored by heart-research fellows either alone or in collaboration with others.

Because of the many promising avenues of investigation that have been opened in heart disease in recent years, this field and the basic related sciences cannot, however, afford smaller numbers—and can well use greater numbers—of highly trained workers who are at a stage in their development where they can establish and carry on important research studies.

MEDICAL TEACHING

That heart teaching in the medical schools could be improved and expanded has been recognized and the schools have done much toward this end. The need, however, is a continuing one, that grows as it continues. The rapid and marked advances of heart research have brought this about, having, in a sense, a disconcerning impact upon medical education.

Not only is the subject matter of medical-school courses influenced as new knowledge is obtained, but, because of advances in clinical methodology and instrumentation, the mechanical and physical means of medical instruction are also affected. To maintain up-to-date instruction on heart disease it has become increasingly necessary that the schools put extra time, money, and effort into a constant improvement of their heart-teaching program.

The schools have manifested not only interest and willingness but also have taken positive action, to the extent that available funds and support and the particular condition within each school permit, to strengthen and improve heart teaching. The direction that this effort must take varies from school to school and can only be determined by the school itself in the best American tradition of academic freedom. In some places the major needs are for differently trained personnel, in some for additional personnel, in others for improved teaching equipment, and in still others for an expanded curriculum or greater coordination.

The investment which the medical schools and their supporters, both public and private, are making in this field is an investment in better heart care for the people of the United States. The medical students of today are the doctors of tomorrow. Already the percentage of heart-disease cases in the average medical practice is high; the number of persons who will go to their physicians because of heart disease will increase still more in the coming years. It is therefore, especially important that students now and in the future be given strong courses of instruction in heart disease, thoroughly covering the latest advances.

MEDICAL TRAINING

The programs of training for already practicing physicians in the clinical aspects of heart disease conducted throughout the country through the auspices of medical societies and cooperating groups, such as heart associations, health departments, hospitals, and medical schools, have strengthened in recent years and represent a healthy and encouraging facet of the nationwide endeavor against heart disease. Reflecting work toward meeting an increasing need, these programs range from single lectures through short courses, symposia, clinics, longer-term courses, and so on to sustained, intensified training for a year or more.

If these programs were not in existence, or if they were not to continue and grow, a serious gap would be left in the national attack on heart disease. For through them physicians—and allied workers because there are also courses for professional personnel such as nurses—are better fitting themselves for clinical and other phases of activity in the heart field, both in practice and academic medicine.

There is a new philosophy toward heart disease, once considered inevitable and unconquerable. The attitude of unreasoning fear and spirit of fatalism used to pervade both the public and the professions. Physicians and researchers today have a positive approach and philosophy. But heart disease still means—to too many of the general public—a short life and a death sentence. The fact that this attitude is changing is itself encouraging. But it is changing slowly. Not all know, as they should, these basic facts:

> Heart disease is not one but many diseases * * * of the heart and the blood vessels * * * with many causes.

Some types of heart disease can be prevented * * * and some types can be cured.

It has been proved that, either without therapy or by medical and surgical treatment, every kind of heart disease formerly considered incurable and rapidly fatal, can be reversible.

Most patients with heart disease can be materially improved * * * not only saving lives but bringing useful, happy years * * * by proper treatment and management.

All types of heart disease can be handled best if diagnosed early and treated properly.

Heart disease does not necessarily prevent one from living comfortably and earning a living, providing the type of work is selected according to the limitations of the individual.

Symptoms and signs suggesting heart disease do not necessarily mean a diseased heart.

On the part of many medical authorities and scientists there is today confidence that within the next quarter of a century the Nation can master much, if not all, of the untimely death and disability caused by the major types of heart disease.

FELLOWSHIP AND RESEARCH GRANT AWARDS, 1952–53

AMERICAN HEART ASSOCIATION, INC., NEW YORK, N. Y.

The American Heart Association has established fellowships to develop a continuing program of productive research and to develop future leaders in the broad field of cardiovascular function and disease. Two classes of fellowships are awarded annually as follows:

1. Fellowships for established investigators, open to individuals of proven superiority and originality with a doctorate or equivalent degree, who are interested in a career in research.

2. Research fellowships, open to graduates of approved medical or graduate schools who are interested in research and intend to follow an academic career.

Career investigatorships are available to a few outstanding persons of unusual ability and originality.

The American Heart Association also will support grants-in-aid for research in cardiovascular function or disease, or related fundamenal problems for periods of from 1 to 5 years, subject to annual review.

Applications for research fellowships, for established investigatorships and for grants-in-aid are considered once a year by the research committee. Nominations for career investigatorships are considered at appropriate intervals as funds permit. Application blanks and information bulletins concerning each of the various categories may be obtained from the medical director of the American Heart Association.

The awards listed in the announcement were made by the board of directors of the American Heart Association on recommendation initiated by the research committee and approved by the executive committee of the scientific council.

During the past year, applications for approximately 55 fellowships and 108 applications for grants-in-aid were received by the research committee.

The limitation of funds available for research precluded the support of many worthwhile fellows and requests for research grants-in-aid.

FELLOWSHIP AWARDS

CAREER INVESTIGATOR

LORBER, VICTOR, Minneapolis, Minn., 40; University of Illinois School of Medicine, 1937; Ph. D., University of Minnesota, 1943; the study of myocardial metabolism, especially fatty acid and ketone body metabolism; the study of trace constituents of the myocardium; University of Minnesota Medical School. Original award July 1, 1951.

CONTINUED ESTABLISHED INVESTIGATORS

BLOCH, EDWARD H., Cleveland, Ohio, 37; University of Tennessee College of Medicine, 1945; Ph. D., University of Chicago, 1949; a study of the living microscopic blood, blood flow, and vessel walls in patients and experimental animals with

thromboembolic phenomena; Western Reserve Unitversity School of Medicine. Five years beginning October 1, 1950.

ELKINGTON, J. RUSSELL, Philadelphia, Pa., 41; Harvard Medical School, 1937; cardiovascular physiology; University of Pennsylvania School of Medicine. Five years beginning April 1, 1949.

FISHMAN, ALFRED P., New York, N. Y., 33; University of Louisville School of Medicine, 1943; cardiodynamic and renal interplay in the production of congestive heart failure; Mount Sinai Hospital. Five years beginning September 1, 1951.

GERGELY, JOHN, Boston, Mass., 33; University of Budapest, 1942; Ph. D., University of Leeds, 1948; energetics and contractile proteins of heart muscle; Massachusetts General Hospital. Five years beginning October 1, 1951.

HELLER, JOHN H., Wilton, Conn., 30; Western Reserve University School of Medicine, 1945; metabolic and endocrine basis of hypertension and arteriosclerosis; Yale University School of Medicine. Three years beginning July 1, 1951.

MERRILL, JOHN P., Waban, Mass., 34; Harvard Medical School, 1942; the further development of the artificial kidney as a therapeutic and investigative tool in cardiovascular and renal disease; Peter Bent Brigham Hospital. Five years beginning July 1, 1950.

MOMMAERTS, WILFRIED F. H. M., Durham, N. C., 1934; Ph.D., Kolezvar, Klausenberg, Hungary, 1942; biochemistry of muscular contraction; Duke University School of Medicine. Three years beginning July 1, 1949. Extension—2 years beginning July 1, 1952.

TOBIAN, LOUIS, JR., Boston, Mass., 31; Harvard Medical School, 1943; the relation of steroids and sodium to hypertension; the role of steroid intoxication in toxemia of pregnancy; the role of emulsifying forces in plasma in atherosclerosis; Harvard Medical School. Five years beginning April 1, 1951.

NEW ESTABLISHED INVESTIGATORS

AIKAWA, JERRY KAZUO, Winston-Salem, N. C., 31; Bowman Gray School of Medicine, 1945; immunophysiology; Bowman Gray School of Medicine. Five years beginning October 1, 1952.

EDELMAN, ISIDORE SAMUEL, San Francisco, Calif., 32; Indiana University School of Medicine, 1944; body water and electrolytes studied with tracers; University of California School of Medicine. Five years beginning July 1, 1952.

KUHNS, WILLIAM JOSEPH, Pearl River, N. Y., 34; Johns Hopkins University School of Medicine, 1948; immunological and immunochemical studies in rheumatic fever; Hospital of the Rockefeller Institute for Medical Research. Five years beginning July 1, 1952.

PETERSON, LYSLE HENRY, Philadelphia, Pa., 32; University of Pennsylvania School of Medicine, 1950; volume pressure; distensibility of intact veins; arterial circulation with view to calculating stroke volume; integration of peripheral cardiovascular reflexes; University of Pennsylvania School of Medicine. Five years beginning July 1, 1952.

STAMLER, JEREMIAH, Chicago, Ill., 33; Long Island College of Medicine, 1943; experimental atherosclerosis; experimental hypertension; renal function in edema formation; Michael Reese Hospital. Five years beginning July 1, 1952.

STEFANINI, MARIO, Boston, Mass., 35; University of Rome, Italy, 1944; establishment of "profile" of tests for diagnosis of thrombotic tendency; relation of the endocrine system to the blood coagulation mechanism and the pathogenesis of thromboembolism; possibilities of employment of fibrinolysin in the treatment of thromboembolism; New England Center Hospital. Five years beginning October 1, 1952.

RENEWAL RESEARCH FELLOWS

ALEXANDER, JAMES KERMOTT, Stoughton, Mass., 32; Harvard Medical School, 1946; hemodynamic aspects of mitral stenosis; under Robert F. Loeb, Presbyterian Hospital (New York), beginning September 1, 1952.

CAVERT, HENRY MEAD, Minneapolis, Minn., 30; University of Minnesota Medical School, 1951; metabolism of heart tissue investigated with isotopic techniques; under Maurice B. Visscher, University of Minnesota Medical School, beginning July 1, 1952.

CONN, HADLEY LEWIS, JR., Philadelphia, Pa., 31; University of Indiana Medical School, 1944; measurement of renal and hepatic blood flow; etiology of ST segment—T wave depression pattern; under Charles C. Wolferth and Carl

Schmidt, Robinette Foundation and University of Pennsylvania School of Medicine, beginning July 1, 1952.

HACKEL, DONALD BENJAMIN, Cleveland, Ohio, 31; Harvard Medical School, 1946; cardiac metabolism in intact dogs studied by venous catheterization of the coronary sinus; under Thomas D. Kinney, City Hospital and Western Reserve University School of Medicine, beginning July 1, 1952.

HADDY, FRANCIS JOHN, St. Paul, Minn., 30; University of Minnesota Medical School, 1947; pulmonary vascular resistance; pulmonary edema; under Maurice B. Visscher, University of Minnesota Medical School, beginning October 1, 1952.

KHAIRALLAH, PHILIP A., Durham, N. C., 24; Columbia University College of Physicians and Surgeons, 1951; biochemistry of heart muscle, proteins; under W. F. H. M. Mommaerts, Duke University School of Medicine, beginning September 1, 1952.

LANDON, ERWIN JACOB, Berkeley, Calif., 27; University of Chicago School of Medicine, 1948; studies on the metabolism of steroid compounds—possible relationships to cardiovascular disease; under David M. Greenberg, University of California School of Medicine, beginning July 1, 1952.

MILLER, JOSEPH HENRY, Los Angeles, Calif., 29; University of Colorado School of Medicine, 1947; development and application of a mechanical heart-lung for intracardiac surgery in the human; under Harry Goldblatt, Cedars of Lebanon Hospital (Los Angeles), beginning January 1, 1953.

NELSON, CLIFFORD VINCENT, London, England, 37; B. S. (in electrical engineering), Massachusetts Institute of Technology, 1942; the electrical field of the heart; under E. C. Cherry and W. F. Floyd, Imperial College of Science, Middlesex Hospital Medical School (London), beginning April 1, 1952.

OSBORN, JOHN JAY, Woodbury, N. Y., 35; Johns Hopkins University School of Medicine, 1943; continuation of work on experimental studies of methods for the interruption of the cardiac and pulmonary circulations, by whole-body refrigeration and mechanical oxygenation; under L. Emmett Holt, Jr., New York University-Bellevue Medical Center, beginning July 1, 1952.

NEW RESEARCH FELLOWS

BIGGS, MAX WILLIAM, Oakland, Calif., 32; Harvard Medical School, 1945; lipoprotein metabolism in health and disease; under John H. Lawrence, Donner Laboratory, University of California School of Medicine, beginning July 1, 1952.

GARB, SOLOMON, New York, N. Y., 32; Cornell University Medical College, 1943; physiology and pharmacology of isolated mammalian heart muscle; under McKeen Cattell, Cornell University Medical College, beginning July 1, 1952.

KIBLER, ROBERT FRANKLIN, Durham, N. C., 28; Duke University School of Medicine, 1948; splanchnic circulation and metabolism; under J. D. Myers, Duke University School of Medicine, beginning July 1, 1952.

KLEINERMAN, JEROME I., Cleveland, Ohio, 29; University of Pittsburgh School of Medicine, 1946; studies of myocardial nutrition and circulation in animals by the radiosodium clearance method; under Thomas D. Kinney, Cleveland City Hospital, beginning July 1, 1952.

MCINTOSH, HENRY DEANE, Durham, N. C., 31; University of Pennsylvania School of Medicine, 1950; receptor areas in the control of blood volume and electrolytes in man; under James V. Warren, Duke University School of Medicine, beginning July 1, 1952.

MALLOV, SAMUEL, Syracuse, N. Y., 33; Ph. D., University of Syracuse Medical College (in biochemistry), to be conferred in 1952; effects of ethyl alcohol and acetaldehyde on the metabolism of the myocardium and other tissues; under Jay Tepperman, Syracuse University Medical College, beginning July 1, 1952.

MATEER, FRANK MARION, Pittsburgh, Pa., 31; University of Pittsburgh School of Medicine, 1944; cardiovascular effects of specific electrolyte depletion and repletion studied by means of dialysis technique and ballistocardiographic studies in the normal and abnormal subject; under T. S. Danowski, University of Pittsburgh School of Medicine, beginning July 1, 1952.

MAXWELL, MORTON HARRISON, Los Angeles, Calif., 28; Columbia University College of Physicians and Surgeons, 1946; mechanism of heart failure; under Myron Prinzmetal, Cedars of Lebanon Hospital (Los Angeles), beginning September 1, 1952.

METCALF, JAMES, Needham, Mass., 30; Harvard Medical School, 1946; changes during pregnancy in the circulation and respiration of normal women and those with heart and pulmonary disease; under C. Sidney Burwell, Boston Lying-In Hospital, beginning July 1, 1952.

MITCHELL, GEORGE LEE, JR., Decatur, Ga., 34; Emory University School of Medicine, 1950; serum and muscle electrolyte studies in various disease states; under A. J. Merrill, Emory University School of Medicine, beginning July 1, 1952.

ROWE, GEORGE GILES, Madison, Wis., 31; University of Wisconsin Medical School, 1945; a clinical study of the role of the sympathetic nervous system in hypertension evaluated via the action of sympatholytic and depressor drugs; under Charles W. Crumpton, University of Wisconsin Medical School, beginning July 1, 1952.

The stipend for established investigators is at the rate of $6,000 to $9,000 per annum and for research fellows, $3,500 to $5,500 per annum.

RESEARCH GRANTS-IN-AID

CONTINUED GRANT AWARDS

	Amount, 1952–53
Western Reserve University School of Medicine, Cleveland, to study in vivo the microscopic changes in the circulating blood and the reactions of small blood vessels in patients with heart disease and thromboembolism receiving anticoagulant therapy, by Edward H. Bloch. July 1, 1951–June 30, 1953	$3,864.00
Mary Imogene Bassett Hospital, Cooperstown, N. Y., for a correlation of the morphologic and metabolic aspects of cell damage, by Joseph W. Ferrebee. Sept. 15, 1951–Sept. 14, 1954	7,140.00
University of Minnesota Medical School, Minneapolis, for the investigation of etiologic and pathogenic mechanisms in rheumatic fever as revealed through studies of basic relationships of immunological, endocrinological, and biochemical events to pathologic processes related to those responsible for rheumatic disease, by Robert A. Good. July 1, 1951–June 30, 1954	6,825.00
University of Pennsylvania School of Medicine, Philadelphia, for the study of the biochemical pathways by which cholesterol and fat are synthesized and matabolized in the body; the action of hormones upon the biosynthesis of cholesterol and lipids, by Samuel Gurin. Sept. 1, 1951–Aug. 31, 1954	10,500.00
Oklahoma Medical Research Institute, Oklahoma City, for the study of the influence of adrenal cortical hormones on cardiac lesions and enzymes, by Charles D. Kochakian. July 1, 1951–June 30, 1953	4,200.00
Tulane University of Louisiana School of Medicine, New Orleans, for the study of cytochemical and histochemical approaches to renal physiology, with particular reference to electrolyte reabsorption in congestive failure, by Nathaniel B. Kurnick. July 1, 1950–June 30, 1953	9,135.00
Massachusetts General Hospital, Boston, for the study of factors that regulate extracellular fluid volume in the normal and edematous subject, by Alexander Leaf. July 1, 1951–June 30, 1953	4,725.00
Tulane University of Louisiana School of Medicine, New Orleans, for the study of hemodynamic and iron-storing function of ferritin, with particular reference to the kidney, by H. S. Mayerson. July 1, 1950–June 30, 1953	3,675.00
University of Michigan Medical School, Ann Arbor, for the study of cardiac metabolism as related to epinephrine-induced arrhythmias and tachycardia, by Mark Nickerson. Sept. 1, 1951–Aug. 31, 1953	5,880.00
Cornell University Medical College, New York, for the study of the relationship between increased activity of the adrenal cortex and posterior lobe of the pituitary gland and fluid and electrolyte retention in edema, by Robert F. Pitts. July 1, 1950–June 30, 1953	8,085.00
Council on Rheumatic Fever and Congenital Heart Disease, for cooperative research study of the relative effectiveness of ACTH and Cortisone in the treatment of rheumatic fever and the prevention of rheumatic heart disease. David D. Rutstein, Chairman. Jan. 1, 1951–Dec. 31, 1955	3,500.00
Yale University School of Medicine, New Haven, for the study of the metabolic basis for heart failure and for treatment of the same, by William T. Salter. July 1, 1951–June 30, 1953	3,885.00

CONTINUED GRANT AWARDS—continued

State University of New York Medical Center at Syracuse, N. Y., for the study of the nervous control of water and electrolyte exertion by the normal kidney, by Otto W. Sartorius. July 1, 1951–June 30, 1953 ..... $4,515.00

Marine Biological Laboratory, Woods Hole, Mass., for the study of molecular mechanism of muscular contraction, by Albert Szent-Gyorgyi. July 15, 1951–July 14, 1954 ..... 10,000.00

Harvard Medical School, Boston, for studies on the relationship of the adrenal to hypertension, by George W. Thorn. July 1, 1951–June 30, 1954 ..... 4,200.00

Duke University School of Medicine, Durham, for the study of the response of the pulmonary vascular bed to hemodynamic alterations in the systematic circulation, by James V. Warren. July 1, 1950–June 30, 1953 ..... 5,250.00

New England Center Hospital, Boston, for the physiologic investigation of experimental isolated pulmonary insufficiency and pure right-sided heart failure, by C. Stuart Welch. July 1, 1951–June 30, 1953 .. 5,250.00

NEW GRANT AWARDS

Medical College of Georgia, Augusta, for the study of the comparative effects of the adrenolytic agents on the cardiovascular system of the dog when administered in the presence of humoral or neurogenic hypertension, by Raymond P. Alquist. July 1, 1952–June 30, 1954 ... 4,462.50

Bowman Gray School of Medicine, Winston-Salem, for the study of immunophysiology, by Jerry K. Aikawa. Oct. 1, 1952–Sept. 30, 1953 ..... 3,150.00

Hahnemann Medical College and Hospital, Philadelphia, for the study of investigation of the cardiovascular and respiratory dynamics in patients with valvular deformities before and after surgery, by Charles P. Bailey. July 1, 1952–June 30, 1954 ..... 5,250.00

La Rabida Jackson Park Sanitarium, Chicago, for the study of the nature and mode of action of the substance in testicular extract causing increased vascular permeability, by Earl P. Benditt. July 1, 1952–June 30, 1953 ..... 5,302.50

Temple University School of Medicine, Philadelphia, for the study of the nature of endocarditis and glomerulonephritis in animals with arteriovenous fistulae, as well as obtaining more information on factors influencing susceptibility to these diseases, by J. Richard Bobb. July 1, 1952–June 30, 1953 ..... 2,625.00

Mary Imogene Bassett Hospital, Cooperstown, N. Y., for the study of lung volume restriction as a respiratory stimulus in normal subjects and patients with cardiorespiratory disease, by James Bordley III. Apr. 1, 1952–Mar. 31, 1953 ..... 5,250.00

Columbia University College of Physicians and Surgeons, New York, for the study of renal and hepatic vascular reactivity in glomerulonephritis, essential hypertension and cirrhosis, by Stanley E. Bradley. July 1, 1952–June 30, 1953. Sponsored by the Westchester Heart Association 3,675.00

The Johns Hopkins Hospital School of Medicine, Baltimore, for the study of autonomic effects of cerebral cortex on experimental renal hypertension, by Kenneth M. Browne. July 1, 1952–June 30, 1953 ... 3,675.00

Massachusetts Institute of Technology, Boston, for the study of chemical investigation of the heart, active principle of Crataegus (Hawthorne), by George H. Buchi. July 1, 1952–June 30, 1953 ..... 6,300.00

Cornell University Medical College, New York, for the study of effects of drugs and poisons on the action potentials and automaticity of heart muscle, by McKeen Cattell. July 1, 1952–June 30, 1953 ..... 4,971.35

Fels Research Institute, Antioch College, Yellow Springs, Ohio, for the application of the Fels oxygenator in prolonged bypass of heart and lungs, by Leland C. Clark. July 1, 1952–June 30, 1953 ..... 3,675.00

University of Pennsylvania, Graduate School of Medicine, Philadelphia, for the measurement of the work of breathing and pulmonary function in patients with dyspnea, by Julius H. Comroe. July 1, 1952–June 30, 1954 ..... 6,300.00

NEW GRANT AWARDS—continued

University of Pittsburgh School of Medicine, Pittsburgh, for studies of cardiovascular effects of cation and anion depletion by vivo-dialysis by F. S. Danowski. July 1, 1952—June 30, 1953	$6,195.00
Columbia University College of Physicians and Surgeons, New York, for studies of fresh and preserved vascular grafts during various types of preservation; the effect of certain drugs on the implanted grafts and anastomoses, by Ralph A. Deterling, Jr. July 1, 1952–June 30, 1953	7,350.00
Wayne University, Detroit, for the isolation, chemical proof of structure, and pharmacological examination of the heart poison from Pilocereus Sargentianus Orcutt, by Carl Djerassi. July 1, 1952–June 30, 1953	6,184.50
Faculty of Medicine, McGill University, Montreal, for studies tracing fate of labeled cellular elements in atherosclerotic lesions in rabbits fed cholesterol, by G. Lyman Duff. July 1, 1952–June 30, 1953. Renewal	5,013.75
University of California School of Medicine, San Francisco, for studies on water distribution and water kinetics in patients with edema, by Isidore S. Edelman. July 1, 1952–June 30, 1953	3,675.00
University of Pennsylvania School of Medicine, Philadelphia, for studies on the supra-optico-hypophyseal system in the normal dog pertaining to volume regulation; an effort to provide at least a partial explanation of certain phenomena observed in markedly edematous patients with heart disease, by J. Russell Elkinton and Russell D. Squires. July 1, 1952–June 30, 1953	4,200.00
State University of New York, Syracuse, N. Y., for the study of some substrates and enzyme inhibitors on cardiac muscle by Alfred Farah. Apr. 1, 1952–Mar. 31, 1953	4,410.00
American University of Beirut, Beirut, Lebanon, for the effect of Krebs cycle inhibitors on the performance and metabolism of the isolated mammalian heart and the effect of cortical hormones on the salt and water excertion in a heart-lung-kidney preparation, by George Fawaz. July 1, 1952–June 30, 1954	4,725.00
Emory University School of Medicine, Atlanta, for the study of the nature of the vascular response to sodium restriction, by Eugene B. Ferris and Albert A. Brust. July 1, 1952–June 30, 1955	5,250.00
University of Maryland Medical School, Baltimore, for the study of factors causing obesity and the influence of obesity in the development of arteriosclerosis and other cardiovascular diseases, by Frank H. J. Figge. July 1, 1952–June 30, 1953	5,166.00
Mount Sinai Hospital, New York, for the study of the volume of the respiratory dead space and the composition of alveolar gas in subjects with cardiopulmonary disease, and the continuation of studies on congestive heart failure in dogs, by Alfred P. Fishman. Sept. 1, 1952–Aug. 31, 1953	3,675.00
Georgetown University School of Medicine, Washington, D. C., for hemodynamic studies in dogs using a variable heart pump permitting independent control of rate, output, and ejection velocity, by Edward D. Freis. July 1, 1952–June 30, 1954	5,250.00
Mount Zion Hospital, San Francisco, for studies concerning the metabolism of cholesterol, by Meyer Friedman. July 1, 1952–June 30, 1953	6,300.00
Washington University School of Medicine, St. Louis, for the study of metabolic factors in experimental heart failure, by Robert F. Furchgott. July 1, 1952–June 30, 1954	5,250.00
Johns Hopkins Medical School, Baltimore, Md., for the analysis of the role of the personal factor and of certain drugs in experimental tachycardia, by W. Horsley Gantt. July 1, 1952–June 30, 1953	5,250.00
Institute for Medical Research, Los Angeles, for the study of capillary circulation in experimental renal hypertension in dogs, by Harry Goldblatt. Jan. 1, 1953–Dec. 31, 1952	3,780.00
Vanderbilt University School of Medicine, Nashville, for the application of the oxygenator to acute heart failure, by Frank Gollan. July 1, 1952–June 30, 1953	3,675.00

NEW GRANT AWARDS—continued

Yale University School of Medicine, New Haven, for the study of hemodynamic factors affecting electrolyte metabolism and the renal excretion of electrolytes, by Allen V. N. Goodyer. July 1, 1952–June 30, 1953	$5,775.00
Bowman Gray School of Medicine, Winston-Salem, to study the nature of and the factors leading to the production of the vasoconstriction and the vasodilation which develops in perfused organs, by Harold D. Green. July 1, 1952–June 30, 1954	4,830.00
University of California, Berkeley, for tracer studies of the intermediate metabolism of amino acids and related compounds of significance for hypertension and arteriosclerosis, by David M. Greenberg. July 1, 1952–June 30, 1953	5,250.00
University of California, Berkeley, in aid of the investigation of steroid metabolism and possible relations to cardiovascular disease, by David M. Greenberg. July 1, 1952–June 30, 1953	525.00
University of Texas Medical Branch, Galveston, for the study of endocrine and other factors in the induction and pathogenesis of experimental hypertension with special reference to parabiotic hypertension, by Charles E. Hall. July 1, 1952–June 30, 1953	5,985.00
University of Utah, School of Medicine, Salt Lake City, for the study of pharmacology, physiology, and biochemistry of the heart, by Stewart C. Harvey. July 1, 1952–June 30, 1953. Renewal	6,300.00
Presbyterian Hospital, Chicago, for the study of identification of the conduction system of the heart, by George M. Hass. July 1, 1952–June 30, 1953	4,200.00
University of Tennessee School of Medicine, Memphis, for the study of the role of the heart, blood vessels, liver and altered body fluids in the hypertension arising in dogs living a month or longer without kidneys, by C. Riley Houck. July 1, 1952–June 30, 1953	5,250.00
Columbia University, College of Physicians and Surgeons, New York, for the study of cardiovascular problems related to surgery, by George H. Humphreys II. Apr. 1, 1952–Mar. 31, 1953	4,200.00
University of Utah School of Medicine, Salt Lake City, for the study of adrenal hormones in the blood of patients with rheumatic fever and related conditions, by Vincent C. Kelley. July 1, 1952–June 30, 1954	5,250.00
Cleveland City Hospital, Cleveland, for the study of effective myocardial circulation or nutrition as studied by the myocardial clearance of radiosodium, by Thomas D. Kinney and Jerome Kleinerman. July 1, 1952–June 30, 1953	3,150.00
University of Tennessee School of Medicine, Memphis, for the study of the role of ventricular filling in the production of the heart sounds with special attention to the etiology of the first and third sound, by Robert C. Little. July 1, 1952–June 30, 1954	2,992.50
Washington University Medical School, St. Louis, for the study of the isolation of specific heart proteins which bind cardiac drugs, by Oliver H. Lowry. July 1, 1952–June 30, 1954	2,940.00
State University of New York School of Medicine, Syracuse, for the study of the effects of ethyl alcohol and acetaldehyde on the metabolism of the myocardium and other tissues, by Samuel Mallov, Sept. 1, 1952–Aug. 31, 1953	525.00
Peter Bent Brigham Hospital, Boston, for an investigation into the relation of renal failure to certain disorders of the cardiovascular system, by John P. Merrill. July 1, 1952–June 30, 1953	5,250.00
Dartmouth Medical School, Hanover, N. H., for the further development and application of electrical impedance methods to the measurement of various cardiac and circulatory problems, by Jan Nyboer. July 1, 1952–June 30, 1953	3,150.00
University of Pittsburgh School of Public Health, Pittsburgh, for the study of congestive heart failure due to valvular disease upon myocardial metabolism in dogs, by Robert E. Olson. July 1, 1952–June 30, 1955	8,925.00
New York University-Bellevue Medical Center, New York, for experimental studies on methods for the interruption of the cardiac and pulmonary circulations by refrigeration and with a new type of oxygenator, by John J. Osborn. July 1, 1952–June 30, 1953	5,670.00

NEW GRANT AWARDS—continued

State University of New York, College of Medicine, Syracuse, for a study of the effect of various nutrients on the rhythm, contractile force and conduction of the perfused mammalian heart, by Jane Sands Robb. July 1, 1952–June 30, 1953	$5, 250. 00
Mount Zion Hospital, San Francisco, for the study of the role of potassium in maintenance of blood pressure and peripheral vascular reactivity in normotensive and hypertensive states, by Ray H. Rosenman. July 1, 1952–June 30, 1953	4, 200. 00
University of Washington School of Medicine, Seattle, for study of factors influencing diastolic filling and systolic emptying of the ventricular chambers, by Robert F. Rushmer. Jan. 1, 1952–Dec. 31, 1953	5, 250. 00
University of Wisconsin School of Medicine, Madison, for the study of mechanism of pyruvate and a-katoglutarate oxidation in heart muscle, by D. Rao Sanadi. July 1, 1952–June 30, 1954	4, 200. 00
Ohio State University School of Medicine, Columbus, Ohio, for the study of changes in the ionic composition of the intracellular fluid in experimental and clinical hypertension, by Leo A. Sapirstein. July 1, 1952–June 30, 1953	5, 250. 00
Bowman Gray School of Medicine, Winston-Salem, for experimental and clinical studies of acute and chronic disorders of the pericardium, by C. Glenn Sawyer. July 1, 1952–June 30, 1953	2, 625. 00
Harvard Medical School, Boston, for studies on coronary heart disease, by Monroe J. Schlesinger. July 1, 1952–June 30, 1954	4, 200. 00
Mount Sinai Hospital, New York, for evaluation of the role of the kidney in the pathogenesis of heart failure, by Jonas H. Sirota. July 1, 1952–June 30, 1954	3, 150. 00
Michael Reese Hospital, Chicago, for the study of factors regulating renal function and electrolyte metabolism in experimental venous congestion with edema, by Jeremiah Stamler. July 1, 1952–June 30, 1955	4, 200. 00
New England Center Hospital, Boston, for the study of the relation of the endocrine system to the blood coagulation mechanism and to the pathogenesis of thromboembolism; possibilities of employment of fibrinolysin and fibrinolytic substances in the treatment of thromboembolism, by Mario Stefanini. July 1, 1952–June 30, 1955	5, 250. 00
University of North Carolina School of Medicine, Chapel Hill, for an evaluation of the Macacus rhesus monkey as an experimental animal for the production of atherosclerosis including studies on cholesterol metabolism using C14 labeled acetate, by C. Bruce Taylor. July 1, 1952–June 30, 1954	9, 450. 00
Harvard Medical School, Boston, for biochemical comparison of hypertensive and normal arteries, with particular attention to the electrolyte and intermediary metabolism, by Louis Tobian, Jr. Apr. 1, 1952–Mar. 31, 1954	4, 200. 00
University of Illinois College of Medicine, Chicago, for the pathogenesis and treatment of experimental renal hypertension, neurogenic hypertension, and spontaneous hypertension in dogs and monkeys, by George E. Wakerlin. July 1, 1952–June 30, 1953	5, 250. 00
Albany Medical College, Albany, for a physiological quantitation of the progressive effects following production of mitral stenosis and/or insufficiency by means of implanted plastic prostheses, by Harold C. Wiggers, July 1, 1952–June 30, 1953	5, 250.00

EXECUTIVE STAFF REPORT TO THE ASSEMBLY, 1952–53

AMERICAN HEART ASSOCIATION, NEW YORK, N. Y.

HOW NATIONAL HEADQUARTERS OF THE AMERICAN HEART ASSOCIATION USES ITS SHARE OF CONTRIBUTIONS (1952-1953)

As we enter the fifth year of our existence as a voluntary agency, the signs are all about us that the American Heart Association has now truly come of age. The objectives wisely set in our early, formative years are being achieved on an ever-growing scale.

The public, losing its old fears and apathy about the cardiovascular diseases, has shown itself increasingly willing to join the physician and the medical scientist in the fight against these disorders. We see evidence of this in the continuing growth of our national structure, in the fact that laymen in greater numbers than ever before are serving officially on heart association boards and committees throughout the country.

We can measure the growing public confidence in our program in terms of its steadily increasing financial support for our work. We can reasonably and confidently anticipate a still greater increase in funds in the future. And as funds available to us mount year by year, we are able to move forward to an expansion in our research program and to a significant broadening of our community services.

Our basic policies, tested against experience, have been altered as the need arose to meet changing conditions. Their execution has been facilitated by the establishment of a number of operational committees whose functions are now precisely related to the many different interests and problems within our field.

Our growth and maturity as an organization is reflected, too, in a steadily greater participation in panel discussions and in the establishment of policy by the members of our assembly, the democratic governing body to whom this report is addressed.

The accompanying chart shows how the funds of the AHA are being distributed under the direction of the board of directors. They provide a statistical answer to the question of what is done with the 25 percent of the money obtained by the affiliates that goes to the national office.

The chart and the narrative material in this report are not simply an accumulation of data concerning the activities of the different divisions of the national office. They are presented, and they should be considered, as representing in highlight form what the staff does directly or through committees to serve our affiliates. They are a brief interpretation of the efforts made to put flesh and blood upon the policies and decisions laid down by the assembly, the board of directors, and all committees of the association for the benefit of the whole heart association program.

If it is not already clear, it should be plainly stated now and borne constantly in mind that the national office's primary function is to provide service and leadership to the affiliated heart associations. Even in such patently administrative matters of internal routine as bookkeeping and maintaining the central files, our objective is to achieve maximum efficiency at minimum expense, so that the greatest number of dollars may be released for the essential program work of the association, and so that in this routine way as well we may provide a model to affiliates.

It should be emphasized that this is a team report. It is our hope that as the months pass there will be a growing realization that the name, American Heart Association, does not mean a remote office in New York but, rather, the sum total of all heart associations throughout the country whose national office, comprising a well integrated team dedicated to serving the interests and needs of all the affiliates, is simply an extension of every individual heart association office.

Organizational Development

During the past year our directly affiliated associations have increased to 59. More than 965 physicians and 950 laymen serve on the boards of directors of these affiliated heart associations. Three hundred and fifty-six chapters are now officially organized—an increase of 34 during the past 12 months.

Voting membership lists have increased by some 2,500; approximately 7,500 physicians and 7,000 lay people now constitute the voting membership of heart associations throughout the country.

Continuing affiliation is dependent upon the filing of administrative and organization, program, and finance reports. There has been marked improvement in the preparation of these reports. The committee to review and coordinate activities of affiliates has met twice to study these reports and make recommendations to the board of directors. Letters have been written to all affiliates by the president of the American Heart Association highlighting the recommendations of the committee.

A simplified accounting system was prepared and has been helpful in many areas. The ultimate goal is a more uniform method of keeping financial records so that reports may be comparable and easily prepared. Particular stress is being placed upon the necessity of preparing reports on a local basis, a State basis, and a national basis, accounting for all funds received and showing how such moneys were expended.

The office was moved September 1952 to 44 East 23d Street resulting in greater space at no increase in rent. All personnel are now on one floor which lends itself to more economical and efficient operation.

Medical

Research program

The sum of $757,577.74 was allocated to the research committee from the 1952 campaign fund for use during the fiscal year, 1952–53. During the year, a total of 170 new applications, 71 for fellowships or investigatorships and 99 for grants-

in-aid, were processed by the medical division. Six new established investigatorships, 9 renewal fellowships, 21 new fellowships, and 45 new grants-in-aid were approved. In addition, 1 career investigator, 14 established investigators, and 25 grants-in-aid were administered on a continuing basis. Because of lack of funds, 14 of the 45 approved grants-in-aid, representing requests for a total of $62,212.50, could not be supported.

A comprehensive review of the research program of the association, covering the 5-year period since the start of the program, is now being made. The support of research by affiliates and local heart associations, insofar as information has been provided to the national office, has been compiled.

ANNUAL SCIENTIFIC SESSIONS

For the first time, abstracts of papers submitted for presentation at the sessions have been processed by the medical division prior to their submission to the members of the program committee. More than 150 such abstracts were received.

In addition to the 6 regular scientific sessions, a special session on electrocardiography and vectorcardiography has been arranged to provide for the exceptional interest shown in these disciplines. The sessions this year are also unique in the number of panel discussions arranged. There will be 5 of these, including the clinical pathological conference.

PROFESSIONAL JOURNALS

The three professional periodicals of the association—Circulation, Circulation Research, and Modern Concepts of Cardiovascular Disease—have enjoyed wide distribution and critical approval.

The initial subscription list for Circulation Research has exceeded the fondest expectations of the publications committee. At the present time there are more than 1,700 subscribers, more than 1,000 of whom subscribe also to Circulation. The sale of advertising space in both journals has also been most gratifying.

Modern Concepts of Cardiovascular Disease has continued to enjoy tremendous interest and is now distributed regularly to more than 39,000 physicians each month. The statement on prevention of rheumatic fever (January 1953 issue) has had a distribution of more than 100,000 copies to date.

The division is working cooperatively with the New York Heart Association in preparing for the distribution of the Nomenclature and Criteria for the Diagnosis of Disease of the Heart, a publication of the New York Heart Association which is to appear soon in a completely revised and expanded edition.

PROFESSIONAL EDUCATION

The committee on professional education, under the chairmanship of J. Scott Butterworth, M. D., is engaged in the formulation of a general plan which can be developed over a period of years. Meanwhile, it has been possible to engage in a variety of activities which are of immediate benefit.

The sale of latex rubber heart models, first made available last year, continues briskly. Arrangements have been completed for painting individual models or sets of models with fluorescent paints upon request. A considerable list of orders is being filed as rapidly as models are painted.

Utilizing the heart models and the flurodemonstrator developed in his laboratory, Dr. Butterworth has planned professional exhibits for the annual meetings of the American Heart Association, the American College of Physicians, and the American Medical Association. The Association of American Medical Colleges has asked that heart models and fluorodemonstrators be made available on loan for demonstration on a preview circuit through the medical colleges of the United States and Canada during the fall. The fluorodemonstrators will then be available by purchase.

There have been conversations with representatives of the New Hampshire Heart Association relative to a pilot postgraduate teaching program in cardiology for general practitioners.

OTHER COMMITTEES OF THE SCIENTIFIC COUNCIL

Through the committee on international affairs, the American Heart Association was represented by leading cardiologists at the Fourth Inter-American Cardiological Congress in Buenos Aires in September 1952. (In cooperation, with the National Heart Institute and with representatives of the Armed Forces,

the staff is assisting the chairman of the committee on international affairs in planning for the forthcoming Second International Cardiological Congress which will be held in Washington, D. C., in September 1954 and continued in other medical centers in the United States.)

Interest in developing and maintaining high standards for cardiovascular clinics has increased greatly in communities all over the country. A step in strengthening local responsibilities was taken in December by transferring to the affiliated heart associations the authority for certifying cardiovascular clinics through their own committees on clincs. The committee on clincs will continue to set standards designed to provide optimum clinic care and will give specific advice to clinic committees on request.

The medical division has assisted the committee on ballistocardiography and the committee on cardiac catheterization and angiocardiography in preparing reports which will appear in circulation and be available thereafter as reprints.

An ad hoc committee on heart disease in pregnacy has supplied up-to-date and concise material for the preparation of a pamphlet which fills a long recognized need in our health-education literature.

Through the advisory committee of the registry on cardiovascular pathology, the American Heart Association continues to cooperate with the Registry of Cardiovascular Pathology at the Armed Forces Institute of Pathology in Washington, D. C.

The subspecialty board on cardiovascular disease continues to examine candidates for certification as cardiologists by the American Board of Internal Medicine and to assist the American Medical Association by certifying hospitals for residence training.

COUNCIL ON RHEUMATIC FEVER AND CONGENITAL HEART DISEASE

Major emphasis in the work of the council during the past year was placed on the prophylactic aspects in the care of rheumatic-fever patients. Two statements on preventive measures, one on the protection of hospitalized patients, the other for those cared for at home, were published in the official periodicals of the association. The statement on prevention of rheumatic fever was also published almost simultaneously in nine other professional journals, both here and in England. This statement, containing diagnostic criteria for streptococcal infections of the throat and guidance for immediate and long-term prophylactic procedures for rheumatic individuals, in intended to be the focus for an intensive community program on prevention.

The chief statistician of the association has continued to provide technical and statistical assistance and guidance to the cooperative rheumatic fever study. During the past year, the study has been in the process of evaluating the results of treatment with ACTH, cortisone, or aspirin in about 750 carefully studied cases of acute rheumatic fever. This evaluation will not only clarify relative merits of the three drugs in the treatment of acute rheumatic fever, but promises also to yield valuable data on the natural history of the acute phase of the disease.

Finally, the division assisted in the development of various professional and lay pamphlets for which the council took responsibility. Among these, the following might be mentioned: The Diagnosis of Congenital Defects of the Heart in General Practice, Heart Disease in Pregnancy, Heart Disease in Childhood. Of this latter pamphlet, 77,000 copies have been purchased.

SECTION ON HIGH BLOOD PRESSURE RESEARCH

The medical division has assumed responsibility for the staff work of the section on high blood pressure research. The proceedings of the annual meeting, council on high blood pressure research, 1952 have been edited and published by the staff and are now available from the office of the association at cost.

SECTION ON CIRCULATION

The activities of the section on circulation center upon the annual scientific sessions and the annual dinner of the section.

SECTION ON CLINICAL CARDIOLOGY

Officers and standing committees of the section on clinical cardiology have been appointed on an interim basis and the first business meeting of this new section is to be held during the week of the annual scientific sessions.

SECTIONS ON CARDIOVASCULAR SURGERY AND BASIC SCIENCES

A section on cardiovascular surgery has been initiated with the appointment of Drs. George H. Humphreys II and Jere W. Lord as chairman and secretary pro tem. A number of leading cardiovascular surgeons in the United States have indicated a desire to join the founding group. Papers on cardiovascular surgery are being presented as one of the scientific sessions this year.

Steps toward the development of a section on basic sciences have been taken with the appointment of Dr. William Hamilton as chairman, pro tem. A slate of officers and committees has been appointed to develop rules and regulations and to initiate a program which will meet the interest of investigators and other members of the association who are interested primarily in research.

SCIENTIFIC COUNCIL

The division assisted the officers of the scientific council and its major committees in planning and developing the new sections. A letter has been sent to all physician-members of the association urging them to apply for membership in the council and in one of the sections and to participate in the activities of the section.

OTHER PUBLICATIONS

In addition to the publications listed in the preceding paragraphs, the division has cooperated in the preparation and publication of several other pieces for distribution.

The association will publish and distribute a study and review of existing motion-picture films on cardiovascular subjects. This monograph form has been prepared by Dr. David Ruhe and his associates of the Medical Audio-Visual Institute of the Association of American Medical Colleges.

In answer to frequent requests, arrangements have been made with professional members of the association to prepare articles for publication in lay periodicals.

All materials prepared in staff for lay distribution, including pamphlets and news releases, and the news sections of Circulation and Circulation-Research are reviewed routinely by the division for scientific accuracy.

EXTRADIVISIONAL ACTIVITIES

The division has participated in the training course for staffs of affiliates and in several of the regional conferences.

COMMUNITY SERVICE AND EDUCATION

During the past year there has been a significant expansion of community heart programs. There has been an increased coordination between those concerned with the problems of the cardiovascular diseases—the medical and allied professions, official and voluntary health and welfare agencies, business, industry and labor, civic organizations, and lay leaders. This community interest resulting in program expansion has insured the success of the American Heart Association as a voluntary health agency in helping to provide a channel between medical science and the public so that the discoveries of medical science can be more easily applied.

The name of the public health division has been changed to community service and education. This action has been taken as a result of the board of directors' decision to create a council on community service and education, as a counterpart of the scientific council. The public health director will be known as the director of community service and education and will be responsible to the new council. Functioning under his direction will be the staffs on program consultation, educational materials, and public information.

PROGRAM DEVELOPMENT

Through the guidance of the public health committee, and its subcommittees on cardiacs in industry and screening and case finding, the division has engaged in a variety of activities in promoting the expansion of community programs.

The division has provided continuing program consultation to heart association staffs and board and committee members through field visits, correspondence, conferences, and meetings.

Steps were taken to initiate, expand and improve rheumatic fever programs in such areas as prevention, control, case finding, home care, and public education.

Plans to implement the recommendations made by the ad hoc committee on labeling low sodium foods included publication of the statement in the Journal of the American Medical Association with copies sent to the Food and Drug Administration and the United States Public Health Service and followup with trade associations. Affiliates were advised and instructed in the use of this statement.

Annual program reports of affiliates were reviewed, summarized, and analyzed and a report and recommendations sent to the committee on affiliation.

The division assisted in the planning and arrangements for annual meeting assembly panels and with the staff conference of heart associations.

Assistance was given affiliated associations in obtaining staff personnel.

The rehabilitation program has made substantial progress. This will be accelerated with the employment of a rehabilitation consultant.

IN-SERVICE TRAINING

An in-service training institute for professional paid and volunteer staff of heart associations was held in September in New York City.

Six regional conferences for board and committee members and staff were organized covering 40 States to discuss program development and expansion.

COOPERATION WITH OTHER AGENCIES

In addition, the division staff engaged in activities to help coordinate the work of the American Heart Association with other agencies and organizations.

Plans were developed for the interchange of program information between affiliate associations, State health departments, Public Health Service, Office of Vocational Rehabilitation, and crippled children agencies. Included, as an example of cooperative promotion, was the joint announcement on rehabilitation programs from the division and the Federal Security Agency, Office of Vocational Rehabilitation.

There was preliminary exploration with Purdue University and the Department of Agriculture regarding work simplification on the farm.

A statement on the use of 70-millimeter photofluorographic films as a method of case finding for heart disease was prepared and distributed in cooperation with the National Tuberculosis Association, the National Heart Institute, and the Chronic Disease Division of the Public Health Service.

A protocol was developed with the Vocational Advisory Service and the New York Heart Association for a study on the vocational counseling of children with cardiovascular disease.

PREPARATION AND DISTRIBUTION OF EDUCATIONAL MATERIALS

Educational materials are planned to tie in as closely as possible with program trends and activities. To give impetus to the cardiac-in-industry program, three related booklets were published aimed simultaneously at the three chief groups concerned with the problem:

Returning Cardiacs to Work is issued as a companion piece to the earlier Work Classification Unit, and is a handbook for the private physician.

These Hands Are Able is addressed to management.

Facts About Employment and Heart Disease supports the statement that "cardiacs can work." This leaflet is addressed to patients with heart disease and their families, and offers reasons for convincing employers as well.

Other recently produced publications are:

Heart Disease in Children

Heart Disease and Pregnancy

Food for Your Heart, a diet manual for patient and physician

Be Smart, Protect Your Heart, a leaflet of good health advice for popular distribution

Your Heart and How It Works, a schematic heart diagram for use in schools, clinics, study groups

Heart Chart, for use by speakers, bureau lecturers, and others

It's Your Heart, four health educational bulletin board posters designed chiefly for display on office and industrial bulletin boards.

Two popular pamphlets were revised:

Heart Disease Caused by Coronary Arteriosclerosis
High Blood Pressure

Many reprints or adaptations of magazine articles were issued in a format that features them as American Heart Association publications. Such publications include:

Varicose Veins, Cause and Cure
101 Questions and Answers About Your Child's Heart and Your Own
How Should We Look at Heart Disease
What the Heart Association Does for the Practicing Physician
Don't Worry About Your Heart

Sometimes the reprint process works in reverse, as when the medical journal GP reprinted in their pages our booklet, Returning Cardiacs to Work.

The educational materials section has also worked closely with the medical division to edit and produce the handbook for the general practitioner, Diagnosis of Congenital Cardiac Defects.

In cooperation with the National Heart Institute, the staff prepared and distributed Diseases of the Heart, Facts and Figures. This has been invaluable as a statistical guide to affiliated associations and writers.

A paper-bound edition of the popular You and Your Heart was arranged for and distribution suggestions sent on to affiliates.

Even though lack of funds has prevented us from producing new films, the American Heart Association has been able to make new films available to heart associations by reviewing and reproducing for national distribution good films developed by affiliated heart associations and by other associations. Round Trip—produced by the Missouri Heart Association (rheumatic fever film), and Working With Your Heart, an account of the Cleveland work classification unit, are two examples.

In the field of exhibits we have worked with our public relations counsel to make available small portable units that can be used as a focal point for local exhibits; one featured an illuminated transparency, the other a plastic, palpitating heart. In lieu of developing many exhibits, we very often advise individual heart associations on developing their own localized exhibits. Whenever warranted, we send to affiliates exhibit worksheets with photographs and details of heart association's exhibits that could be adapted to any heart association program.

With every new publication, film, or exhibit released by the national office goes an educational materials memorandum outlining suggestions for using the material to the best advantage in a local program.

An arrangement was made with three major instrument companies to include a copy of Recommendations for Human Blood Pressure Determination by Sphygmomanometer with every blood-pressure machine that goes out of their factories.

PUBLIC INFORMATION

The public information staff continued to render publicity and editorial service to all divisions, reporting on the scientific, educational, and organizational progress of the association. The importance of the year-round program of publicity releases to the general and medical press has been clearly established, and during the past year has expanded as our activities have increased. Publicity has been developed into an integral part of the educational program, with an enthusiastic and welcome response from the press and public for news releases featuring the various types of educational materials produced.

The three cardiac-in-industry booklets produced for the patient, employer, and physician were publicized most effectively as a "program package" and, along with Food for Your Heart, the diet manual for physicians and patients, drew an overwhelming response from the press and public.

The association's scientific activities and the various aids to the professional person, prepared by the medical division and the various sections of the scientific council, also have been given wide publicity in the general and medical press. Publicity material produced during the past year interpreted the benefits and objectives of the Statement on Prevention of Rheumatic Fever, other manuals and guides, the heart models, the association's research program, the scientific sessions, the annual meeting of the Council on High Blood Pressure Research, the Inter-American Cardiological Congress, the ACTH-cortisone cooperative study in the treatment of rheumatic fever, the new scientific journal Circulation Re-

search. Publicity releases for the Heart Fund were prepared and distributed during the December and January "buildup" period, and during the campaign month of February.

Guidance was provided to affiliates in adapting national publicity material for use to local advantage, and there was evidence of much more successful placement of national publicity by heart associations.

Under the heading of special events, a Doctors Meet the Press panel discussion was produced for the annual meeting of the Medical Society of the District of Columbia.

Editorial activities included preparation of the 1952 Annual Report, titled "To Live and To Work," and the production of the American Heart Quarterly. The staff prepared the news announcement sections of the association's scientific journals as well as the Assembly Newsletter reporting highlights of board and executive committee meetings.

The inquiries section continues to service a continuously mounting number of requests from organizations, agencies, and individuals for pamphlets and information on all aspects of the heart program.

Fund Raising

It is estimated that a total of between $8,500,000 and $9 million will be raised in the 1953 campaign, as compared with $6,582,132 raised in 1952.

Mr. Bruce Barton served for the third successive year as national campaign chairman, and we are greatly in his debt for the effective leadership he has given to us in that capacity.

In New York on January 9, the American Heart Association and New York Heart Association jointly held a heart inaugural dinner, the highlight of which was the appearance of President Eisenhower. His speech endorsing the heart fund was transcribed on records and filmed for the use of affiliates. Five hundred and twenty thousand reprints of the newspaper article showing "Ike opening the heart-fund campaign" were distributed to affiliates by the national office and sent out in all mail during the month of February.

The president of the association also appointed a new committee on public relations and fund raising. The first chairman of the committee is Sylvester L. Weaver, Jr.

The president of the association appointed a committee on fund-raising policy which prepared and submitted to the board of directors a new fund-raising policy in respect to united appeals. This policy, which was approved by the board contains three main departures from the previous policy. First, it declares a 2-year moratorium during which affiliations with federated campaigns are prohibited except under the most unusual and exceptional circumstances.

Secondly, it establishes the principle that heart associations may continue to participate in the federated funds in which they are now participants only so long as the moneys received substantially meet their fair-share percentage.

Thirdly, the policy incorporates in writing the principle that determination of any program and administrative activities are within the absolute discretion of the Heart Association alone, and interference with these activities by united funds will result in withdrawal of the Heart Association.

The board of directors also adopted a "fair share" plan showing what percentage of the national fund-raising total should be raised by each affiliate in order to meet its fair share. The percentages compiled take into consideration three factors:

(1) Those published by the national quota committee.
(2) Campaign experience of similar organizations.
(3) Sales-management buying-power indexes.

The field staff of the fund-raising division continued to help affiliates by direct consultation on fund-raising methods. During this last year they spent a total of 870 days in the field.

As in the past, affiliates continued to use larger quantities of campaign materials. For example, 4,722,465 mass pamphlets were distributed, as against 3,536,914 in the previous campaign; 3,962,600 heart lapel pins compared with 3,100,000 in the previous year. Affiliates used 47,475 group contribution scrolls (30,000 last year); 799,700 milk-bottle collars (600,000 last year); 1,025,850 school coin cards (625,000 last year). These figures are significant because they show a great increase in campaign coverage and the use of more direct collection devices.

Efforts to secure the support of labor unions have continued and intensified. Publicity in labor publications from all over the country has been widespread and favorable. More labor unions are contributing to the heart fund than ever before. This year, 150 union presidents sent letters to all of their locals asking for contributions in memory of Philip Murray and William Green. The International Association of Machinists has conducted a scroll solicitation of its entire membership.

Informal surveys continue to indicate that memorial gifts constitute at least 10 percent of the total heart-fund income. Most affiliates are now conducting some sort of active memorial gift plan to develop this source of income.

PUBLIC RELATIONS

The public relations of the American Heart Association have continued to develop rapidly in breadth and in depth. Today a tremendous, steady flow of information about the cardiovascular diseases and the heart program is reaching the general public through all media of mass communication.

One important step toward raising the level of medical reporting in the heart field was the establishment of the Howard W. Blakeslee award. Under its terms an award of $1,000 is to be presented annually to the "individual whose creative efforts have contributed most toward public understanding of the cardiovascular diseases in any medium of communication, including newspapers, magazines, books, radio, television, or films." The cooperation of the National Association of Science Writers was obtained in the preparation of award rules and methods of selection of winners.

During the association's annual meeting in April 1952, a "Doctors Meet the Press" panel brought together physicians and science writers for an informal discussion of problems involved in reporting scientific advances in the heart field. This set up a pattern and a technique of promoting cooperation between scientist and layman which has been successfully followed by many heart associations.

The association worked closely with the editors of Parents magazine in the preparation of one of the most important health educational articles of the year, entitled "101 Questions and Answers About Your Child's Heart and Your Own." In this, the guidance of many prominent cardiologists was obtained by the medical division in gathering authoriative information on all phases of heart and circulatory disease.

In general, a very high level of cooperation has been maintained with magazine writers and editors. Among the large circulation magazines publishing articles on different aspects of the heart-disease problem—in many cases lead articles—were Woman's Home Companion, Saturday Evening Post, Reader's Digest, This Week, Collier's, Good Housekeeping, Quick, Look, and Business Week.

In addition to the Blakeslee award, a bronze medallion award of merit was aproved for presentation to individuals who have rendered valuable services to the association in connection with its fund raising and public relations activities.

During the past year, the first annual Albert Lasker award for distinguished achievement in the cardiovascular field was presented by the Albert and Mary Lasker Foundation, through the American Heart Association, to Dr. Paul D. White. The presentation was made by Dr. Irving S. Wright at a dinner held in Boston on February 2 which officially launched the 1953 heart fund campaign in Massachusetts.

The science writer carrying out the research reporting project initiated to present to laymen a dramatic story of the meaning, needs, and accomplishments of cardiovascular research has completed his first report. The form of publication of this report is now under consideration. The material obtained through interviews with more than 200 investigators in the field has already been utilized extensively in the orientation of national magazine and newspaper writers and editors and in the development of special radio and television shows.

Collaboration with the American Medical Association's Bureau of Health Education and the Community Service and Education Division of the American Heart Association led to the production of Heart of America, a series of thirteen 15-minute transcriptions which local medical societies are presenting jointly with heart associations.

The Human Heart, a series of eight 15-minute transcribed stories of people who learned to live with heart disease were prepared under the joint auspices of the American Heart Association and the National Heart Institute.

With each year, the affiliated heart associations have increased the scope and intensity of their own publicity activities. In order to give them practical assistance in the development of publicity in all media, and to promote coordination between national and local policies and objectives, the national office has prepared and distributed a publicity manual for heart associations, a guide to the planning of year-round publicity programs.

As a matter of basic policy, the heart-fund campaign publicity was projected in relation to an educational message, emphasizing the hopeful aspects of the heart-disease problem. This year the core of this message was formulated in a leaflet, Five Facts You Should Know About Heart Disease. The five facts were also widely publicized in radio and television shows, and in magazine and newspaper editorial comment.

There is no question that the national publicity directly supporting the 1953 heart-fund campaign has far exceeded that of any previous year. This was particularly true of television which has now emerged as perhaps the single most important communication medium for bringing the heart fund to the attention of the public. In recognition of this development, the association's radio and television advisory committee has been considerably expanded; as it is now constituted, it brings together top leadership from all the radio and television networks and virtually all the important advertising agencies.

The heart-fund campaign was given very extensive radio and television coverage both locally and nationally. All four radio networks broadcast special half-hour shows, devoted to the heart fund and originating in key cities. In these again, as last year, musical talent was contributed by the music performance trust fund of the American Federation of Musicians.

The association prepared and distributed radio and television spot announcements, transcription records including appeals by prominent figures in public life and the entertainment field, television films, and slides. Special kits for local radio and television outlets contained prepared talks, interviews, and round table discussions.

It can be conservatively estimated—on the basis of logs submitted by local stations—that the total number of spot announcements broadcast or telecast during the campaign was well in excess of 250,000.

Press participation was also very extensive. Each of the major syndicates cooperated in the preparation and distribution of not one but many feature stories. The association supplied, for local use, editorials, photographs, special-feature articles, mat sheets, and campaign logotypes.

The remarkable volume of publicity during the past year indicates an immense and still rapidly growing public interest in the heart story.

Dr. WRIGHT. May we also request that the History, Policies, and Program of the American Heart Association, which is a statement of the American Heart Association, may be made a part of this record?

The CHAIRMAN. Certainly. That likewise contains information that very properly should be made a part of this hearing.

(The matter referred to is as follows:)

THE HISTORY, POLICIES, AND PROGRAM OF THE AMERICAN HEART ASSOCIATION

Diseases of the heart and blood vessels, known technically as cardiovascular diseases, unquestionably constitute the most serious of all existing threats to the health of the American people. It has been conservatively estimated that some 10 million men, women, and children suffer from some form of heart or circulatory disorder. According to the latest available figures from the National Office of Vital Statistics, these diseases caused 771,000 deaths in 1952 in the United States. It should be noted that 35 percent of all deaths under the age of 65, the most productive years of life, are caused by the cardiovascular diseases. Over the age of 45, approximately 1 out of every 2 deaths is caused by heart and circulatory disease.

The American Heart Association, with its nationwide network of affiliated and cooperating heart associations, is the only voluntary health organization

devoting all its efforts to the reduction of death and disability caused by the cardiovascular diseases. The purpose of this statement is to outline briefly the history of the association, its formation and development, its organizational structure and its program.

FORMATIVE YEARS

The American Heart Association was formed in 1924 by a group of America's leading cardiologists. At a meeting held 2 years earlier to initiate the formation of the new organization, its objectives were defined in these words:

"The function of such an association would be to coordinate all activities bearing on the heart problem, to develop new lines of research, to collect and distribute information, to further public health and industrial education, and to develop a sound public opinion as to the true meaning and seriousness of the problem."

Today, some 30 years later, that statement is still a fair, if incomplete summary of the objectives of the American Heart Association. But it was not until 1948 that these aims began to be implemented on a scale approaching the magnitude of the problem. In that year the American Heart Association was reorganized as a national voluntary health agency. Laymen were admitted to membership and to positions on the governing bodies. The attack on heart disease became vested in an active partnership between the physicians and the public.

Up to 1940 the association had carried on a modest program. It established standards, held scientific meetings, distributed educational materials, encouraged the establishment of new heart associations and cardiac clinics, and published a scientific journal.

By 1940 many of the directors were dissatisfied with the limited scope of these purely professional activities. It was the conviction of the medical members that the association should finance urgently needed research in the cardiovascular field. Furthermore, they believed that the time had come for a broad community approach to the cardiovascular diseases. Only by opening the door to lay participation and the development of a vigorous research and community service program would it be possible to deal effectively with heart and blood vessel disorders on the vast scale dictated by their prevalence.

Active steps toward broadening the association were taken in 1946; they culminated 2 years later in the reorganization of the American Heart Association as a national voluntary health agency. This marked a significant step forward by providing leadership and a national program for the fight against heart disease.

Physicians themselves are thus responsible for the initial realization that the heart diseases cannot be attacked successfully by medical means alone. Organized voluntary action in cooperation with laymen is required to provide and coordinate the many different resources needed for a threefold assault on the problem—through research, education, and community heart programs.

This concept of partnership between physician and layman is the bedrock on which the association stands. Experience has shown that concerted public participation is required to give the medical profession the means to attack the problem at its source—through research. At the same time it creates the channels through which the benefits of expanding medical knowledge can be brought to those who suffer from some form of cardiovascular disease, by means of professional education, public information, and through the development of community services for the patient.

ORGANIZATIONAL STRUCTURE

The American Heart Association and its affiliated associations and chapters constitute a democratic and voluntarily established structure to help the physician, the heart patient, and the public combat the heart diseases.

National assembly

The overall governing body of the American Heart Association is the national assembly, composed of approximately 400 delegates representing affiliated heart associations selected, according to population, and the various councils and sections of the national organization. At the association's annual meeting, the assembly holds panel discussions on problems in all principal areas of the association's interest and operation. Its recommendations, presented to and de-

bated by the entire assembly, establish directives to the board of directors and executive committee for the following year. The assembly elects the officers and directors of the association.

Scientific council

The scientific and medical program of the American Heart Association is under the immediate direction of the scientific council, open to all medical members of the association and its affiliates. It includes the section for high blood pressure research, the council on rheumatic fever and congenital heart disease and the section on circulation. During the past year steps were taken toward the organization of three new sections, a section of clinical cardiology, and a section on cardiovascular surgery and a section on basic science.

National office

The association's national office directs the national phases of the heart program and guides affiliated associations in the development of its community aspects, providing a clearing house and a source of information, ideas and materials. Its staff is organized into the following divisions: administrative, medical, community service and education, fund raising.

Affiliates

The network of heart association affiliates and chapters has rapidly extended its geographical coverage. In 1948, there were a national office and 18 affiliated associations. Today, in 1953, there are 56 affiliates covering almost all 48 States as well as Puerto Rico, Hawaii and the District of Columbia. They provide leadership to more than 350 local chapters with approximately 15,000 members, divided about evenly between physicians and laymen.

Consultation and guidance are provided by the national office to help affiliates improve their operations through field visits of national staff members, national training institutes, regional conferences and interassociation publications.

The annual meeting of the staff conference of heart associations, an organization composed of executive directors and staff members of affiliates, exercises an important function in interpreting the policies of the national office to State and local groups and in making better known the needs and desires of heart associations to the national organization.

PROGRAM

Research

Lack of knowledge is the greatest present obstacle to the fight against heart disease.

Although there are more than a score of different forms of cardiovascular disease, three of them are responsible for the bulk of heart and vascular damage. These are hypertensive heart disease, coronary heart disease and rheumatic heart disease. The basic causes of none of these disorders is as yet fully understood. It is clear, then, that decisive progress in controlling heart disease depends on the acquisition of new knowledge. For this reason the program of the American Heart Association has rested, from the beginning, on a foundation of research.

The national research support program of the American Heart Association is a joint undertaking of the national office and affiliated State and local heart associations. The national office allocates to research at least half of its 25-percent share of the total funds raised in the annual heart fund campaigns. A substantial portion of the balance retained by affiliated heart associations and their chapters is devoted to the financing of additional scientific investigations in their respective areas as part of their own separate research programs.

The 5-year record of research awards in both the joint national program and the separate local research programs of the affiliates is shown below. These figures represent the formative years of the American Heart Association as a voluntary health agency during which only limited funds have been available. Since the association began its national research support program in 1949, progressively higher sums have been allotted, making a total of almost $6½ million. Between 1949 and 1953 the number of fellowships awarded grew from 26 to 53 and the number of grants-in-aid increased from 19 to 70.

Research awards by the American Heart Association and its affiliates, 1949–53

Fiscal year	National	Affiliates	Annual total
1949 (6 months)	$222, 432. 70	$477, 500	$699, 932. 70
1949–50	386, 385. 83	513, 600	899, 985. 83
1950–51	502, 326. 28	710, 600	1, 212, 926. 28
1951–52	605, 157. 10	990, 500	1, 595, 657. 10
1952–53	809, 830. 59	(1)	(2)
5-year total (estimated)			6, 500, 000. 00

[1] Estimated; more than $1 million.
[2] Estimated; more than $2 million.

The aim of the association's research policy is to help develop a climate in which research can move forward freely and continuously toward its goals. It strives to attract into the cardiovascular field the first-rate minds of skilled, imaginative scientists of proven talent and creative ability, and it tries to make it possible for them to carry on their work without restricting pressures and without becoming too heavily burdened with teaching and administrative responsibilities.

Research support is made available by the association under the following categories.

1. Established investigatorships are awarded annually for a 5-year period to scientists of proven ability and superiority who are interested in a research career. They are assured of support during long-range development of their work.

2. Research fellowships are granted for renewable 1-year periods to persons interested in research who plan to follow an academic career. They conduct their studies under seasoned leadership.

3. Grants-in-aid are made on a project basis to experienced investigators working in nonprofit institutions, medical schools, hospitals, and laboratories who have demonstrated their productiveness or who otherwise give promise of accumulating useful new information.

The American Heart Association has also established a form of research support unique among voluntary health organizations. This is the career investigatorship which offers lifetime support to recipients selected for exceptional creative ability in experimental work. The awards include both personal stipends and funds to cover laboratory expenses and overhead.

The career investigator is free to follow his ideas in whatever direction they may develop. He may work in an institution of his own choosing; the only limitation imposed on him is that he can spend no more than 15 percent of his time in teaching. To date, the association has appointed three career investigators.

Professional education

In order to put medical research to the use for which it is intended—helping human beings—it is necessary to narrow the gap that often exists between a scientific discovery and its actual application to save a life, to avert or lessen disability.

Communications between the research scientist and the clinical physician who deals with patients are being speeded up by the American Heart Association through the development of broad professional education programs. These programs provide practical information and tools to physicians and closely allied professional groups such as nurses to help them deal more effectively with patients.

The annual scientific sessions and special activities of the various sections and councils of the scientific council are increasingly useful in bringing practical information to the medical profession.

The national office produces and makes available a wide range of technical pamphlets, scientific journals and bulletins, manuals and guides, exhibits, teaching aids, films, pamphlets, and cardiac record forms. Its technical publications include Circulation, Circulation-Research, and Modern Concepts. The association cooperates in the distribution of the Heart Bulletin which began publication in 1952 as a new medium for reporting the latest advances in diagnosis and treatment to the physician in general practice.

Among affiliated heart associations, the national office encourages the development of teaching aids as well as conferences, seminars, institutes, postgraduate medical courses, nurses' institutes, and teaching courses in cardiovascular clinics, often arranged with the cooperation of local medical societies.

Public information and education

So much attention is devoted to heart disease these days in the press, on radio and television, and in the magazines that it is difficult to realize how little information was available to the public through these media only a few years ago. The reason for this was undoubtedly a general apathy, fear, and misunderstanding about the heart diseases and to a large extent the lack of an enterprising national organization and an active nationwide program in the cardiovascular field.

The changed situation and the altered attitudes of press as well as public have been greatly influenced by the public relations policies laid down by the American Heart Association. This approach has exerted a strong effect in arousing public interest and winning the cooperation of the various media of communication in reporting on the increasing progress made in the fight against heart and blood-vessel diseases.

The educational messages of the association reflected in the wide variety of pamphlets, exhibits, films and other materials prepared for general distribution, are designed to stress accurate information without exaggeration or distortion; to correct misconceptions; to substitute encouragement and realistic hope for the fear and fatalism too frequently found in the past; to emphasize the scope of the cardiovascular problem and the belief that heart disease can be ultimately controlled through research; and to urge prompt and proper treatment of heart and circulatory disorders.

The core of the association's educational message is the hopeful concept that something can be done about heart disease. It may be summarized in these five simple facts:

(1) Some forms of heart disease can be prevented * * * a few can be cured.
(2) All heart cases can be cared for best if diagnosed early.
(3) Almost every heart condition can be helped by proper treatment.
(4) Most heart patients can keep on working—often at the same job.
(5) Your symptoms may or may not mean heart disease.

Don't guess or worry. See your doctor and be sure.

Broadly speaking, the health education program is a dynamic effort to change people's behavior in relation to the cardiovascular diseases, encouraging them to accept the responsibility of acting upon the knowledge they receive. This action takes the form of self-help through consultation with a physician to obtain needed medical aid and of participation in community heart association programs to develop the needed facilities and services for patients with heart disease.

Community service

The effectiveness and success of the national heart program is measured in terms of what is accomplished in local communities for individuals suffering from heart disease.

Affiliated heart associations are engaged in furthering community programs for the prevention, care, and treatment of heart disease; in educating physicians and other professional groups and the lay public; and in establishing and maintaining high standards of medical and other services.

The fact that diseases of the heart and circulation are chronic in nature and require long-term care necessitates a high degree of coordination of many medical and nonmedical community agencies and facilities. Among the facilities to be integrated into an effective community cardiac program are medical, nursing and social services; health and welfare agencies; cardiac clinics and hospitals; convalescent homes; educational departments; rehabilitation, vocational training and employment programs.

The American Heart Association assists its affiliates in determining the needs of their communities, in creating or fostering required facilities and in coordinating their programs with those of other voluntary and official agencies in their areas.

It is not possible in this brief account to list in detail the many different community services now being fostered by State and local heart associations.

The following are examples, suggesting important areas of work and achievement.

Heart disease and employment

Since economic pressures are so immediate in most cases of cardiovascular disease, it is only natural that increasing emphasis is being placed on program-building efforts to keep the heart patient on the job or to help him adjust to a different job more suited to his capacities.

This is an extremely complex problem. It involves the national defense program, business and industry, labor organizations, the farm, the family. Until now the work capacities of heart patients have not been adequately utilized, mainly through ignorance of what they can do, and because of the too widely held belief that a heart ailment condemns a patient to a life of invalidism.

The fact is that the person with heart disease is not really handicapped in the literal sense when he works under the proper conditions. If he is selectively placed in a job that fits within his cardiac reserve, and receives proper medical supervision, continued employment is often possible without harmful effect. A large number of cardiac patients can and do work and many more are employable.

Through its cardiac-in-industry committee, the association has provided guidance and materials to stimulate the establishment of local cardiac-in-industry committees and programs by affiliated heart associations and their chapters. In every community where the need is indicated, establishment of a work classification clinic is being encouraged as the facility best able to provide many of the services required to fit the cardiac comfortably in a job.

The work classification unit is concerned with finding out the work capacity of patients referred to it, based on medical diagnosis; with evaluation of the patient's economic and family situation; and with matching the patients' capacities to the various types of jobs for which they may be suited. The units are usually established as part of a cardiovascular clinic or they are set up at a rehabilitation center.

Local cardiac-in-industry committees, established by heart associations to direct the employment and rehabilitation programs in their areas, are composed of physicians, employers, representatives of labor, and other interested agencies in the community. Besides organizing work classification units and rehabilitation facilities where needed, they are sponsoring conferences on the problems of the cardiac worker and in many other ways are trying to arouse their communities to effective action.

Rheumatic fever programs

In addition to scientific advances in the prevention of rheumatic fever through the use of antibiotic drugs, the development of community programs for rheumatic fever patients has done much to reduce the ravages of the disease and to contribute to the optimistic outlook in this field. The American Heart Association is intensifying its efforts to develop complete programs to meet the needs of the young patients by drawing upon the various community services, agencies, and facilities that are required.

Reporting on the progress being made in these programs, the association's new booklet, Heart Disease in Children, states, "As a result of rheumatic fever programs, improved health services, and educational programs among parents, school people, social workers, and nurses, more children are brought to physicians in the early stage of the infection when it is most important that they be kept in bed under medical supervision."

A committee of the association's council on rheumatic fever and congenital heart disease is engaged in the preparation of a report based on a 2-year survey of rheumatic fever programs. The purpose of the report will be to set standards for the development by heart associations of rheumatic fever programs that will assure proper services and facilities to patients. As another means of assisting heart associations in developing such programs, the association has continued a joint project with the Helen Hay Whitney Foundation which maintains a clearinghouse and collection center for information on rheumatic fever facilities and programs throughout the country.

Because rheumatic fever ranks high as a cause of heart disease among children of school age, an important part of a rheumatic fever program is the school health program. The school physician, nurse, and teacher may often play an important role in detecting new cases or recurrences, in referring the child to the family physician or clinic for treatment, and in cooperating with the physician afterward in proper management of the child.

Some heart associations are promoting routine examinations of all schoolchildren entering the first grade as a measure of mass screening for rheumatic or congenital heart disease.

Several associations have sponsored the establishment of a cardiac case registry, a compilation of data on cardiac children and those suspected of having heart disease. This index provides a method of following the children through the school years, and is used to insure continuing medical observation and treatment where needed and to adjust education to the child's physical status when necessary.

FINANCIAL SUPPORT

The chief source of income to the American Heart Association and its affiliates is the heart fund campaign, in which the public is asked for voluntary contributions every February. Additional sources of funds are memorial gifts, legacies and bequests, and other year-round donations.

The 1953 heart fund campaign, the fifth of the association's national fundraising efforts, reached the highest total yet attained. The successful results of the 1953 drive are viewed as an expression of steadily increasing public confidence in the voluntary program to combat the cardiovascular diseases.

The 5-year record of receipts is as follows:

1949 campaign	$2,655,770.00
1950 campaign	4,104,484.82
1951 campaign	5,551,266.57
1952 campaign	6,582,132.50
1953 campaign (estimated)	8,500,000.00

SUMMARY AND CONCLUSION

Remarkable changes have taken place in the past 30 years in the attitude of both physicians and the general public toward diseases of the heart and blood vessels. Until comparatively recently, fear and fatalism were the prevailing attitude; a verdict of heart disease was considered tantamount to a death sentence. This situation has been drastically and rapidly changed.

As Dr. Paul White, of Boston, a founder and past president of the American Heart Association, has put it: "Those of us doctors who graduated from medical school 30 to 40 years or more ago look back now at the almost unbelievable ignorance about heart disease that then existed. More knowledge has come since then than had been acquired in all the centuries before. * * *"

The program of the American Heart Association and its affiliates has made substantial contributions to this great forward movement in knowledge about the cardiovascular disease. The major principles which have guided its thinking and action during the 5 years since its reorganization in 1948 may be summarized under these four points:

1. This is essentially a medical movement, dedicated to the advancement of medical knowledge through research. The fruits of this research must be brought by the quickest and most effective means to the practicing physician and through him to the patient—the ultimate reason for the association's existence.

2. The basic aim is to build a truly effective partnership between physician and layman in order to assure that the program will be soundly conceived as well as efficiently administered and adequately supported.

3. It is essential to stimulate and endeavor to coordinate the activities of appropriate community resources in building programs designed to prevent the cardiovascular diseases and to provide care for those who are afflicted by them.

4. A responsible public awareness of the importance of the cardiovascular-disease problem must be created, together with an objective, hopeful attitude based on knowledge.

It is true that significant advances have been made in the diagnosis, prevention, treatment, and, in some cases, the cure of various forms of cardiovascular disease.

Among the important scientific advances may be listed the prevention of rheumatic fever by the use of penicillin or sulfa drugs, the surgical treatment of certain congenital and acquired heart abnormalities, the surgical and medical treatment and improved methods of management of patients with high blood pressure, the use of anticoagulants in reducing mortality and preventing complications following attacks of coronary thrombosis.

Another outstanding development is the use of antibiotics in the prevention and treatment of subacute bacterial endocarditis, a form of heart disease which was once fatal in almost every case.

There have been many advances in the medical and surgical treatment of diseases affecting the blood vessels in the arms and legs.

These accomplishments, although important, are small in comparison with the job that remains to be done. The basic causes of the most common types of heart disease remain unknown. Their discovery, and the progress in prevention and therapy that will follow, still remain in the future.

Dr. WRIGHT. Now, there are other private agencies which make a real contribution to medical research.

It is impossible to list all of the foundations from which money is obtained for individual investigators. The life-insurance medical-research fund gives large grants during each year, amounting last year, I think, to about $800,000 or more.

I say that from various private sources money is beginning to come into the heart field, but when we are talking about a group of diseases that affect 10 million people, $2 million, or $5 million is 50 cents a head for the people that have the diseases, and that does not seem excessive. In fact, it seems almost miscroscopic.

In addition to these private groups, of course, is the great contribution made by the Public Health Service, and in this particular area of special interest is the National Heart Institute.

Now, I should like to ask Dr. Watt to speak regarding the National Heart Institute.

STATEMENT OF DR. JAMES WATT, DIRECTOR, NATIONAL HEART INSTITUTE, NATIONAL INSTITUTES OF HEALTH, PUBLIC HEALTH SERVICE, DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE, WASHINGTON, D. C.

Dr. WATT. Mr. Chairman, I am Dr. James Watt.

The CHAIRMAN. Will you give your name in full and position for the record?

Dr. WATT. I am Dr. James Watt, Director of the National Heart Institute. I am a regular corps officer of the United States Public Health Service, and have been for number of years.

The work of the National Heart Institute has been given to you in considerable detail in the general statement, titled "Heart Disease," which the chairman has indicated will be made a part of the record of this hearing.

We are a little apologetic about the length of this statement which we submitted, but the importance of this problem is such that we believe detail is desirable and should be considered.

Our own program, representing Federal portion in the partnership of resources against heart diseases parallels and complements in many areas that of the American Heart Association. Our activities are divided into two broad areas, first those in the grants field and second those in our own research operations within the Public Health Service.

This comprises, as you are quite aware, the actual budget structure for appropriation purposes.

I have with me a brief budget history of the National Heart Institute, which I would like to submit for the record if you feel that this would be useful. It is a summary of the appropriations of the National Heart Institute since its inception, following its enabling act in 1948.

The CHAIRMAN. That will be accepted and made a part of the record.

(The matter referred to is as follows:)

National Heart Institute—Appropriations from inception of the program (excluding contract authority)

Activities	Fiscal year 1950	Fiscal year 1951	Fiscal year 1952	Fiscal year 1953	Fiscal year 1954
1. Grants:					
(a) Grants for research and training:					
(1) Research projects	$5,020,000	$4,420,000	$4,809,000	$5,150,000	$6,843,000
(2) Research fellowships	300,000	300,000	300,000	450,000	580,000
(3) Teaching of medical subjects	741,000	741,000	741,000	1,373,000	2,628,000
(4) Training stipends	150,000	150,000	150,000	280,000	400,000
(5) Construction of research facilities	400,000	4,459,000	0	0	0
(b) Grants for detection, diagnosis, and other control activities	2,000,000	2,000,000	1,500,000	1,500,000	1,125,000
Total grants	8,611,000	12,070,000	7,500,000	8,723,000	11,576,000
2. Direct operations:					
(a) Research	1,350,000	1,809,392	1,934,715	2,617,400	2,986,000
(b) Other direct operations:					
(1) Review and approval of research and training grants	0	75,657	75,700	90,100	133,000
(2) Technical assistance to States	437,000	464,848	345,000	345,000	297,000
(3) Administration	327,000	240,103	227,235	224,500	176,000
Total direct operations	2,114,000	2,680,000	2,582,650	3,277,000	3,592,000
Total appropriation (cash)	10,725,000	14,750,000	10,082,650	12,000,000	15,168,000

Dr. WATT. I would like to summarize rather briefly the division in our activities.

One major division is the research grants area.

Dr. Jones referred to it earlier and gave you a brief summary of how this research-grants mechanism operates. We believe that it truly keeps this research program in the hands of the men who are doing the research.

The scientists from the universities and the various other research organizations throughout the country come to our study-section meetings and pass, in an objective fashion, on these research grants.

They are submitted by the individual through the institution or organization in which he works and thence come to the study sections. The applications are reviewed by scientists on the basis of scientific merit.

The council, another group of individuals, another group of people, also meets and reviews these.

They do not spend time duplicating the work of the study sections, but rather their job is to look at these applications in relation to need, in relation to the development of a program, in relation to actually bringing to bear the full weight of our resources on the important phases of the program.

The two groups of organizations complement each other. Scientific judgment of the study section is essential, but also it is important to have with it the judgment of both professional people and laymen looking at the overall picture of the problem and the available resources. Our councils do have, in addition to the professional mem-

bers, leaders in community service throughout the country. The doctors in this help us develop the actual program itself.

Dr. Jones is a member of the Heart Council, and Dr. Andrus is soon to be one of our council members, and has also participated in the grant program in many ways. He is at present in a research laboratory made possible by Federal construction grant money.

We have with us today, if there are any detailed questions you would like to have answered, Dr. J. Franklin Yeager, who is in charge of the research-grant program as well as the teaching-grant program of the National Heart Institute.

The intramural research work done largely at Bethesda both in the Clinical Center and in the other research laboratory buildings is another important part of the Heart Institute program.

I shall speak chiefly of projects being carried on now.

Dr. Berliner who is chairman of our committee of laboratory chiefs is also here and he can give you some comments on the different types of scientific work that is going on.

We have a number of laboratories, some of whose names may not very directly relate to cardiovascular disease. For example, Dr. Berliner on my left is in charge of the laboratory of kidney and electrolyte metabolism.

Superficially, this might seem a little off from cardiovascular disease, but I am sure from the statement you heard earlier about the relationship of the kidney to hypertension you see that there is a direct relationship between studies involving the kidney and its functions and the study of cardiovascular disease. Some others are the laboratories of chemistry of natural products, cellular physiology, and chemical pharmacology.

This only gives a beginning idea of the many things that go on in the Heart Institute.

I could go on talking for a long time, but most of the information is in our prepared statement. I believe it would be much better to let you ask specific questions. If you wish to go into any of the details of the program any of the three of us who are here will be glad to take part in it.

Thank you.

The CHAIRMAN. Mr. Dolliver.

Mr. DOLLIVER. You have been the Director of the Heart Institute for several years; have you not?

Dr. WATT. Less than a year. Dr. Van Slyke, who is here, was the original Director of the Heart Institute and he is now Associate Director of the National Institutes of Health.

Mr. DOLLIVER. How long have you been in your present capacity?

Dr. WATT. Since the 1st of December.

Mr. DOLLIVER. Since the 1st of December?

Dr. WATT. Yes, sir.

Mr. DOLLIVER. I am sure, as a matter of public interest that we would be glad to know the number of people that are engaged in this kind of work directly under you, Doctor.

Dr. WATT. At the present time?

Mr. DOLLIVER. I am talking about the grants to the different universities and the work at the Institute.

Dr. WATT. Would you like to have that by just the different types of scientists and different types of workers?

Mr. DOLLIVER. That would be all right.

Dr. WATT. Could we submit that for the record to go with this budget material, Mr. Dolliver?

Mr. DOLLIVER. That would be very good.

Dr. WATT. All right, sir.

(The matter referred to is as follows:)

National Heart Institute personnel

Research staff:	
Professional (medical officers, chemists, physicists, etc.)	103
Technical assistants (biological, chemical, electronics, etc. aides)	137
Total	240
Research-and-training-grants staff:	
Professional (doctors of science)	3
Other (clerical, typists, stenographers, etc.)	9
Total	12
Administrative staff:	
Professional (Director, executive officer)	2
Technical and clerical (fiscal analyst, secretaries, etc.)	10
Total	12

Mr. DOLLIVER. Now, there is a subject that maybe you do not wish to answer, and maybe you cannot answer, but I think it would be very excellent if it could be answered and come from this hearing. What do you consider the outstanding accomplishment or accomplishments in this field that have come about as the result of the activities of the Heart Institute?

I realize it has been in existence a relatively short time and maybe you cannot put your finger on any direct answer to that question. If you could I am sure it would be of great interest to me, and I believe others as well.

Dr. WATT. That is a tough one to answer, since so many of the developments that occur are really evaluated by hindsight rather than foresight. You look at a new fact today, and you hope it is going to be the key, a rather broad part of the picture. Ten years from now you look back and say, "How could I have been so foolish?" On the other hand maybe you have a key fact worked out. I would be very happy to mention a few of the items that appear to be of particular importance now.

Mr. DOLLIVER. Please do not mistake the purpose of my question. It is not to embarrass you in the slightest, Doctor.

Dr. WATT. Yes, I understand. I am perfectly happy to try to answer. As I say, we really do not think of findings in terms of what is the most and "bestest" of any given time, so it sort of takes you a little unaware when you are asked that question.

I would say this, that some of the studies being run now in the field of atherosclerosis, the field Dr. Andrus talked about, have some of the most exciting possibilities. I think that is probably the work referred to in the article quoted by Mr. Wolverton.

Mr. DOLLIVER. Would you care to be specific at that point?

Dr. WATT. It is a study of the factors which enter into the metabolism of the protein and fat molecules which are in the blood stream. The study actually is beginning to get at the mechanism by which the body takes a big fat molecule and breaks it down into a small harmless

molecule. This involves the study of enzymes, involves organic chemists, and involves a very complicated form of physical work. The ultra centrifuge is used at extremely high speeds for an opposite purpose for which the centrifuge is usually used. The centrifuge you think of as a device to throw heavy particles to the bottom of a tube you are spinning. Actually, Dr. Gofman who came up with this idea, reversed that process, and he used the centrifuge to float particles. This was made possible by adjusting the specific gravity of the fluid in which the blood serum was placed.

It is a technique of study which has let the scientists examine these molecules called lipoproteins, to see how frequently they occur and in what kind of individuals they occur. It has also let them use the enzymes to determine how to split them, how to improve the method of handling them.

Mr. DOLLIVER. Let me see if I can paraphrase your statement correctly. I have not the scientific language at my command that you have, but what you have said, in substance, is that your researchers have gone into the blood stream and you have tried to analyze the various ingredients there of the blood?

Dr. WATT. Right.

Mr. DOLLIVER. To determine how the blood converts certain elements that go into the body into useful or nonuseful deleterious substances that may result in arteriosclerosis or other diseases. Does that somewhere nearly paraphrase it?

Dr. WATT. That is awfully close to being exact. The only variation I would make is that at the moment we do not know which is the cause and which is the effect. We know these substances are present in atherosclerosis. Is there something which causes both of them, or is one the cause of the other?

Mr. DOLLIVER. In other words you do not know whether it is the cause or the effect?

Dr. WATT. We do not know whether it is a hen-and-egg relationship or something else, a third factor which causes both of them.

Mr. DOLLIVER. I take it, too, that in this research into this particular item you are using all of the facilities of chemistry, physics, electronics, radiology, and atom-smashing elements, all of those kinds of things that are available to the modern scientist?

Dr. WATT. Yes, sir, we are, and we are just beginning to use a facility which is just being completed, a clinical center which will let the Public Health Service for the first time actually have at the National Institutes of Health a clinical facility as well as laboratory facilities. This is the first time we have been able to do the total job in the one place, and it makes that unique situation there. We hope that it will be used not only by the Public Health Service, but by everybody.

Mr. DOLLIVER. By the way, have you any patients over there at the present time?

Dr. WATT. Yes, we have patients now. There is a schedule of buildup, which will carry us to somewhere between 200 and 250 patients in total by the end of this fiscal year. Heart is going to have on a scheduled basis approximately one-fifth of the total space, and, as the total increases, the heart patients will increase at about that ratio.

Mr. DOLLIVER. Do you have any other example you would like to give us?

Dr. WATT. Could Dr. Berliner speak on 1 or 2 subjects, Mr. Dolliver, which I think that you would be interested in?

Dr. BERLINER. If I may I would like first——

The CHAIRMAN. Will you give your name in full and your position?

STATEMENT OF DR. ROBERT W. BERLINER, CHAIRMAN, COMMITTEE OF LABORATORY CHIEFS, NATIONAL HEART INSTITUTE, BETHESDA, MD.

Dr. BERLINER. Dr. Robert Berliner, Chairman of the Committee of Laboratory Chiefs of the National Heart Institute.

I would like first to echo what Dr. Watt has said about trying to pick out what is important today, because it is very difficult to say what, by the evidence, actually may turn out to be valid in the future and what may turn out to be just something which was of interest at the time.

I think that from the point of view of immediate possible applications, I would also select the material that Dr. Watt has referred as the thing which was the best bet at the moment—often, however, that turns out to be not the case. I think that if I were to pick out an item which in the long run might be a very good bet to contribute immensely to our knowledge in the field, we might go into things which would appear to have no relationship whatever to heart disease. Such items as the work in the laboratory on cellular physiology, where there has been some excellent work done on the mechanism of protein synthesis, that is the mechanism of building up materials from which the body is made and studies of the way in which energy is converted for use in processes of that sort.

Such things, at the moment, of course, have very little obvious connection with heart disease.

On the other hand, we can go over to things which are more obviously connected with heart disease and discuss some of the studies of drugs used in the treatment of heart disease which, for the moment are of considerable importance. If we should arrive at the point where we really understand heart disease and could do something about curing it and preventing it these drugs would probably fall by the wayside, such things, for example, as study of anticoagulant drugs, a field in which Dr. Wright has done a lot. Studies in the laboratory of chemical pharmacology have considerably improved the understanding of the way these drugs are handled in the body and it provided leads for the synthesis of new, safer and more effective drugs for the same purpose. I do not know if that covers it sufficiently or not.

Mr. DOLLIVER. That is very good, unless you wish to add something more. That satisfies me, Mr. Chairman.

Dr. WATT. I would like to add the one point, it is very difficult to get a picture across with words particularly in a field where descriptive terms are not entirely familiar ones. We can get around this problem by demonstration and one of the things that we are always glad to do is show what we are doing.

Mr. DOLLIVER. I was out there a few years ago, and I went through the Institute. So, I have already accepted your invitation.

Dr. WATT. If there is anyone who would like to see some of these researches we are talking about, we are only too glad to talk to them

where we can point and say, "This is what I am talking about right here."

The CHAIRMAN. I think, so far as our committee is concerned, we would be interested in having as much information as you would feel necessary to give if this were the appropriating committee.

Dr. WATT. I think we have done that, Mr. Wolverton, in the statement we have submitted earlier, particularly in the National Heart Institute program section of the statement.

Dr. JONES. It might be advisable for a non-Public Health officer, to speak on the general subject of what they are doing at Bethesda.

It has been my pleasure to know a little bit about it largely as a member of the heart council.

I am quite certain that the most important feature of the National Institutes of Health in the intramural program is the fact that they now have proper facilities and a tremendously able staff which has been finally assembled solely to go to work, and they have made notable contributions which I think they themselves can speak about. But there is one thing absolutely certain and that is that if any service which has an intellectual interest, which medical research and its support has, does not have an opportunity to work effectively itself and have the research opportunities, I think it becomes a completely sterile operation. I would be certain that in the future as the Bethesda group develops, and they now have interrelations with the various agencies throughout the country and by means of exchange personnel, we will find that not only that it is a very active, effective producer of scientific knowledge, but it is also a means whereby the entire level of Public Health Service function is improved and heightened by the mere fact that it has people of great research competence working with them as colleagues and contributors to the total function of health, education, and service. I think that in its organization in the past few years and with the present practices it really bespeaks the type of development in this country which is of great importance to science and that will give a very good account of itself.

Dr. WRIGHT. I should like to echo those remarks. I believe it will serve as a very great focal point for all medical research, although I strongly believe that we should not attempt to focus all medical research in any one area, as I think everyone here is in agreement, but should have support in many areas and many medical schools. Still to have this Institute here growing strong will represent fine intercommunication as well as a productive research unit in itself.

The CHAIRMAN. The confidence that you express with reference to the future usefulness and accomplishments of the Institute fall in a very pleasing way upon the ears of this committee because this committee, you realize, inaugurated the National Institutes research activity that we have out at Bethesda. So it is very pleasing to note that it meets with the approval of those who are best able to judge, and that they have confidence in its future.

Mr Heselton.

Mr. HESELTON. Perhaps this question should be addressed to Dr. Wright rather than to Dr. Watt or possibly it should be addressed to all of you. It is not intended to be embarrassing either.

I think you do appreciate, from what the chairman said, that one of the responsibilities of this committee in these hearings is not only

to find what is good and what is encouraging, but also to have the very frank advice of people as to where there are any weaknesses, if there are any, and also to know where emphasis has, perhaps, been misplaced, if that is the case.

Have you anything to say about that feature?

Dr. WRIGHT. I would not hesitate to criticize under these circumstances, but as a matter of fact I think considering the limited period of development and the relatively limited resources to date, that they have done a magnificient job. I believe that I have no criticism or any suggestion for improvement. With what is being attempted or planned, 5 years from now it would be very good to take a careful survey of the situation to see where it could be improved.

Mr. HESELTON. I was not confining my question to you, but rather to the question as to whether you feel there is any weakness in our program today, the association program, the Institute program or any other program.

Dr. WRIGHT. I had expected to take that up as a separate subject, but I will be very glad to take it up now if you desire.

Mr. HESELTON. No; I wanted to have that information.

Dr. WRIGHT. I wish to ask for a discussion of the community service aspects of the association throughout the country. I will ask Mr. R. O. Betts, the executive director of the Heart Association, to paint with a broad brush the steps which have been taken by our community service in the handling of this great problem.

Mr. HESELTON. It is a great pleasure to see Mr. Betts here. I have great admiration for what he is doing. He was at Amherst College while I was there. He is also a resident of New Jersey.

The CHAIRMAN. I do not know whether his brilliance depends upon being with you in college or a resident of New Jersey.

STATEMENT OF R. O. BETTS, EXECUTIVE DIRECTOR, AMERICAN HEART ASSOCIATION

Mr. BETTS. I am R. O. Betts, executive director of the American Heart Association.

These few remarks will be confined to the subject of what the American Heart Association is attempting to do to apply the new knowledge that is gained for the benefit of people who are suffering from heart disease.

At the very beginning of our association's activities, when it was reorganized in 1949, when it came to considering the application of preventive measures we had very little precedent on which to proceed.

The same questions and measures that were applicable in the fields of the infectious diseases did not seem to apply to our particular problem, so that our distribution of community service proceeded very cautiously and slowly into this difficult field. So much so that in January of 1950 there was called the First National Conference on the Cardiovascular Diseases, which was held here in Washington, jointly sponsored by the American Heart Association and the National Heart Institute. There was a great deal of very valuable information available, and the arrival at a common agreement achieved through that conference which was attended not only by physicians, but people in the ancillary professions, as they are called, as well. Nursing, medical and social work, and the whole public were all represented.

As the result of the agreements reached at that time the Heart Association began to identify certain of the areas in which community service activity could well be arranged.

It was recognized at the outset that the numbers of people who were involved, because of the widespread nature of these diseases, made it impossible for us to get into the field of direct care of patients.

Therefore, our policies have, from the very beginning, forbidden the use of Heart Association funds for the payment of medical fees or the payment for drugs and other medical services.

Our function, as we have conceived it has been that primarily of introducing programs through community conferences and facilities, not undertaking the problem of actual care, but, rather it has been our function to stipulate, to encourage and to set standards and criteria for effective methods of the care and treatment and to identify where those areas are most badly needed.

I think the first outstanding instance is in the field of rehabilitation, notably what we call our cardiac-in-industry program where it has been the intent of the Heart Association, through community resources to bring together the representatives of management, labor, industry, and medicine, the medical profession itself, and other interested community agencies to share with us in thinking through how it is possible for people suffering from heart disease to remain as useful people who are not a drain on the community.

That has resulted, in many instances up to the present time, in the development of what has been called work classification units, whereby a trained cardiologist, and frequently with the assistance of a psychiatrist, medical and social workers, and public health nurses, to evaluate the working capacity of an individual very carefully. Then there is recommended to him the kind of work or occupation that is suited to his physical limitations. That kind of work is increasingly being encouraged throughout the country.

Another area of interest in the field of community service was one touched on this morning by Dr. Jones in regard to stimulating the widespread dissemination of information relating to methods of preventing rheumatic fever, and particularly the recurrence of attacks of rheumatic fever. That kind of activity is being gradually intensified and stimulated across the country.

More recently there has been a wave of interest in the problem of weight control and several of our associations are now undertaking well-controlled problems under the guidance of physicians looking toward dealing with the question of obesity and the matter of overnutrition that was touched upon again in the discussion this morning.

The remaining thing that I think I should say regarding community services is that in all instances, whether the planning is done nationally or within our State associations or within the local community by affiliates of those associations, program committees of the various community interests sit to consider the planning of these activities. Those committees always contain members of the medical profession, because, as has been said before, this program is essentially a medical program, and it is the intent of the Heart Association that at all points the medical profession will share in the forum, but we will save areas of activity for the benefit of people who suffer from heart disease.

Dr. WRIGHT. Before we ask questions of Mr. Betts I would like to call upon Dr. Perdue, from Miami, who has been interested in certain

aspects of community service as well as other things. I think it will be worthwhile to hear her views as a person practicing in a different type of atmosphere than we have at the central office as represented by Mr. Betts.

The CHAIRMAN. We will be glad to hear Dr. Perdue. Please give your full name and your background so it will appear in the record.

STATEMENT OF DR. JEAN JONES PERDUE, MEMBER OF BOARD OF DIRECTORS, MIAMI HEART INSTITUTE, MEMBER OF BOARD OF DIRECTORS, MIAMI HEART ASSOCIATION, AND PRACTICING PHYSICIAN, MIAMI BEACH, FLA.

Dr. PERDUE. I am Dr. Jean Jones Perdue of Miami Beach, Fla. I am a member of the board of directors of the Miami Heart Association and of the Miami Heart Institute.

As practicing physicians we have to carry to our patients what has been presented to us here today. It is difficult for a practicing physician to always have this information and it has been one of the practices of the Miami Heart Association, along with the Public Health Service and the Miami Heart Institute, to hold seminars which last 2 or 3 days, where speakers have been brought to give this information to the physicians so that they can give it to their patients and take care of them.

We see patients with the end results of hypertension and arteriosclerosis. We see them with their heart attacks, we see them with the drugs we have, and we see them with heart failure. We want to know where to turn to give them the best care. We know that our community needs proper hospitals and proper rehabilitation facilities for them, and I think that is one thing we would like to keep in mind that this committee talks over the needs of the community.

Dr. WRIGHT. If there are any questions on the community-service program from either viewpoint we would be glad to have them.

The CHAIRMAN. Are there any questions, gentlemen?

Mr. HESELTON. How many States are there that do not have heart associations?

Mr. BETTS. All but three have them. Nevada, North Dakota, and Wyoming do not have them, although there is some activity beginning to take place in North Dakota which may finally result in such an association.

Mr. HESELTON. All of your funds come through contributions or legacies?

Mr. BETTS. Legacies and memorial contributions and general contributions.

Mr. HESELTON. Is a drive conducted annually?

Mr. BETTS. Yes; it is put on annually, during the month of February, which has been local heart month.

Mr. HESELTON. I noticed somewhere among your publications that there are approximately 7,000 physicians who are members of the association and only something like 7,000 laymen. It is surprising to me that there are not more who are not professional people who are interested in it.

Mr. BETTS. Actually the number of people who are actively engaged in assisting heart associations in their activities is far greater than

the membership. The voting membership, as we regard it, will never be a very large group of people, but should consist of those who are sufficiently interested to become working active members in the full sense of that term. I would suppose that you could multiply the number of 7,000 by at least 10 if you want to get at the total number of those who are actively participating in one or another form in heart association activity, and that includes assistance in the raising of funds.

(A report of heart association activities for 1952 follows:)

TO LIVE AND TO WORK—1952 ANNUAL REPORT, AMERICAN HEART ASSOCIATION

FOREWORD

Are we winning the war against heart disease? That is what the public wants to know as we intensify our struggle against the greatest health challenge of this era.

The very fact that this question is now so prominent in the mind of the public indicates that one major goal is being achieved. Our vital cause is arousing keen interest and extraordinary dedication on the part of lay and professional citizens alike. This is rapidly replacing the former attitude based on fear, ignorance, and indifference. The change created by a sound, long-range program has been immeasurably aided by the splendid cooperation extended to the American Heart Association by every media of communication.

The 1952 Annual Report of the American Heart Association indicates definite accomplishment in all phases of the carefully conceived plan to fight heart disease that we call the heart program. This program is aimed primarily at saving human lives. This is the first and most important objective. But it is not enough to keep a heart patient alive. The American Heart Association has accepted an equally great additional challenge, namely, to develop techniques and a sympathetic and understanding public which will help the patient maintain himself as a self-respecting and self-supporting citizen—an asset, not a burden, to his family and his community.

The phrase—to live and to work—does not refer to work in an economic sense alone, but also in a personal and social sense. Our community service and educational efforts are aimed to help the heart patient maintain his dignity and value as a human being.

Alert business and labor groups have given increasing support to help cope with these diseases that deplete the trained and skilled supply of workers and strike a deadly blow at the core of industrial management at the peak of executive capacity. Heart disease—especially coronary heart disease responsible for the majority of heart attacks—has taken an alarming toll among the men and women who formulate and execute the plans and policies of business and Government, often cutting them down as they enter the greatest period of their potential contribution to our civilization.

It is especially urgent that this challenge be faced and accepted by all groups concerned because of its significance in meeting the present need for skilled leadership and labor to achieve the defense goals of industrial production.

The waste of available manpower through failure to utilize the services of the many cardiacs who can work, and the importance of a self-supporting job in the rehabilitation process, have led to the development of the association's cardiac-in-industry program. This has proved to be one of the most vital undertakings of the heart program, an area in which dramatic and practical application can be given to the resources of medicine and science.

Scientific knowledge, gleaned from research, is the cornerstone to prevention, treatment, rehabilitation, and all other aspects of a truly sound program. The quest for new knowledge, new methods of care and prevention, must go on unceasingly although, as this report reveals, very important dividends in the form of definite discoveries and progressive steps in the control of certain of the heart diseases have already been achieved. Thanks to mounting public awareness and support, it has been possible almost to triple the sums allocated by the American Heart Association to the research program over the past 4 years.

An inspiring example of the fruits of research is presented in the opening section of this report, in which the role of the association in the rheumatic fever

preventive program is outlined. In a move hailed as a milestone in health progress, the association has taken national leadership in starting a broad campaign to achieve widespread use of approved preventive measures that will save countless lives and lessen disability both in the younger- and middle-age groups.

In this rheumatic fever program, we have an example of how research, first of a basic nature and then as applied research, can be utilized by the association to provide practical working assistance to physicians in dealing with their patients more effectively and in placing within their grasp the most recent and practical knowledge about the cardiovascular diseases. Other examples of this type of service by the association have been applied with some modifications. It constitutes a truly great contribution to the American public—one which they frequently benefit from indirectly but which they may not know is the ultimate source of their help.

In all heart and circulatory diseases, there is need for more professional and lay education so that new knowledge about diagnostic advances, prevention, and treatment can, without loss of time, reach the practicing physician and his associated professional workers as well as the patients, their families, and the public at large.

You are most cordially invited to read this report, digest its contents, and communicate your reactions and interests in it to the officers of the American Heart Association. To complete your understanding of the total heart program, you are also invited to consult the annual report or bulletins of the affiliate of the American Heart Association which serves your community.

Working hand in hand, the national and community heart associations are moving steadily toward their goals with the accent on life, not on death—on work, not on waste—on knowledge, not on fear—and on help, not on despair.

IRVING S. WRIGHT, M. D.,
President.

TO LIVE

SAVING YOUNG LIVES

Heart disease in childhood is one of the most serious challenges to be faced in striving to reduce the tragedy of premature death and avoidable disability. How more appropriately can this account of the fight against heart disease begin than with the story of the salvage of the hearts of our children? Here is truly good news for our youngsters and their parents, carrying an implied message of hope for heart disease sufferers of all ages.

A most important scientific development of recent years has been the prevention of rheumatic fever through the use of penicillin or the sulfa drugs in combating streptococcal infections. Rheumatic fever, usually starting between the ages of 5 and 15, is responsible for most of the heart disease in children and a large share of heart trouble in early adulthood. In the total heart-disease picture, rheumatic fever sufferers are not as numerous as those with high blood pressure and hardening of the arteries, which afflict the older-age groups, but their number is greater than the victims of other more publicized childhood diseases. Of the total of 10 million persons estimated to have some form of heart or blood-vessel disease, half a million of these are children of school age.

The springboard to prevention was the discovery that rheumatic fever, a recurrent disease, is usually preceded by an infection of the nose or throat caused by a germ known as the beta hemolytic streptococcus. The effort to prevent the initial as well as recurrent attacks of rheumatic fever and consequent damage to the heart has therefore centered around the early and adequate treatment of strep infections.

At least 3 out of every 100 who get strep infections develop rheumatic fever several weeks later, if they are not promptly treated. Among those who have suffered a previous attack of rheumatic fever, the incidence is much higher.

Guide to prevention

In recognition of the magnitude of this problem, the association's council on rheumatic fever and congenital heart disease set to work mustering the knowledge and the weapons available to launch a concentrated attack on one of the most vicious diseases of our time. A special committee of the council drew up a statement on prevention of rheumatic fever, a fusion of varying points of view regarding the best procedures to be followed in the use of penicillin and sulfa drugs for this purpose. The statement was completed toward the end of 1952, in time to be given wide circulation before strep infections reached their customary winter and spring peak.

Because of the greater dangers of strep infection to known rheumatics, the council also prepared and distributed a companion statement addressed specifically to children's and general hospitals, suggesting protective measures to be taken for rheumatic fever patients cared for in wards.

Major health problem

Despite the progress in prevention and treatment of rheumatic fever, it still ranks high as a major health problem and will continue to do so for years to come.

In the rheumatic fever field, no less than in other areas of heart and circulatory ills, basic causes are still unknown, and therefore much additional research is needed. Although scientists have turned their big guns on streptococcal infection as the forerunner of rheumatic fever, they canont yet explain the exact chain of events that leads from the strep infection to the ultimate development of rheumatic fever.

ACTH-cortisone study

No miracle drugs have yet been found to cure rheumatic fever once it has developed, but scientific investigators have been studying the effectiveness of hormone agents in treating the symptoms. The association's council on rheumatic fever, in conjunction with the British Medical Research Council has been conducting a 3-nation cooperative study, begun in 1951, to observe the comparative effects of ACTH, cortisone, and the salicylates (aspirin) in the treatment of the acute stage of rheumatic fever. The cooperative research study, first of its kind in the rheumatic fever field, was conducted at 13 centers in the United States, the United Kingdom, and Canada. Final results are being gathered and evaluated at a central coordinating center at the office of the American Heart Association.

Preliminary report

In an interim report, the investigators noted that although acute symptoms subsided with all three agents, it was still too early to draw firm conclusions regarding the most effective drug. The investigators hoped in their further studies to find some answer to the crucial question—how effective are these drugs in preventing the damaging effects of rheumatic fever on the heart?

Much additional community program development is needed to put into action all available knowledge about rheumatic fever. The educational and community program aspects of the campaign to combat rheumatic fever are dealt with in a later section of this report.

RESEARCH : KEY TO PROGRESS

The life-saving advances that have been made in the prevention of rheumatic fever have inspired those who are fighting against heart disease to new efforts and new hope for success in other areas of this complex field—areas which not so many years ago seemed hopeless both to the physician and the public alike.

The key to progress against heart disease is scientific research. Research opens the door of knowledge to reveal the causes and mechanisms responsible for disease conditions, and thus makes it possible for medical scientists to develop suitable measures for prevention and treatment.

Cardiovascular research is the most complex kind of scientific investigation because of the many forms of heart and blood vessel disease. Three major disorders—rheumatic fever, hypertension (high blood pressure), and arteriosclerosis (hardening of the arteries)—are responsible for over 90 percent of all heart diseases. The national research-support program of the American Heart Association and its affiliates is, therefore, concentrated in these areas.

The public, which is always eager to learn about dramatic cures, wonder drugs, and miracle operations, should bear in mind that the accounts of spectacular developments in the public press represent in many cases only incomplete, indefinite, and often inconclusive steps toward what may in time become an ultimate medical triumph. Behind many of these incidental successes that look toward major victories are months and years of false starts, blind experiments, frustration, and even heartbreak on the part of scientists who are struggling so that the hearts of others may be saved.

Bright hopes for future

The following are a few examples to indicate in a general way the kinds of research paths that are being followed in the cardiovascular field and the broad problems facing the research scientist. The American Heart Associa-

tion and its affiliates are financing important studies in almost every aspect of these major problems.

Hardening of arteries.—Among the bright hopes for the future is the recently developed and widely held conviction that hardening of the arteries, responsible for well over half the deaths from heart and blood-vessel diseases each year, is neither inevitable nor irreversible. Hardening of the arteries is not necessarily associated with the process of aging, but rather it is now generally viewed as a disease of fat metabolism, representing a breakdown of the mechanism by which the body handles the fatty particles which are either developed within the body or which are taken into it in the food one eats. Intensive studies of these fatty particles, particularly cholesterol, and their relationship to hardening of the arteries, are now going forward in a number of laboratories throughout the country. Artery hardening is a forerunner of the heart attack and of the stroke.

Further studies were proceeding with anticoagulant therapy, and efforts were being made to find new and effective substances that check blood clots which form in narrow and diseased arteries.

Heart surgery.—Surgery on the heart has had a long history. It has become practical and relatively commonplace from the surgeon's viewpoint only during the last decade.

Spurred by recent surgical successes in repairing certain types of heart damage resulting from rheumatic fever and congenital deformities, scientists have been seeking ways of bypassing blood around the heart during surgery so that the surgeon can operate in full vision and in a dry field. One method for doing this, which has been attracting a great deal of attention, is the mechanical heart. During the past year, the first known case of a patient's survival through the use of an artificial heart machine was hailed as foreshadowing new possibilities for cardiac surgery. The development of this mechanical heart was a fine example of teamwork by scientists supported by the Michigan Heart Association, an affiliate of the American Heart Association, and engineers of the General Motors Corp. The substitute heart was used to detour the blood supply from the left ventricle of a 41-year-old man for almost an hour while his heart was opened by surgeons to repair a defective valve.

Progress also was reported during the past year in blood-vessel-grafting operations, bringing greater possibilities of relief to soldiers suffering battle injuries and other patients needing such surgical procedures.

High blood pressure.—Research has not yet found a way to prevent high blood pressure, another major condition responsible for damage to the heart and arteries. In many cases, however, thanks to research, we have learned methods for the control of elevated blood pressure through surgery, diet, and drugs. Ninety percent of high blood pressure is of the essential type of which the cause is unknown. Scientists have been devoting much attention to suspected factors, including nervous and glandular influences, personality traits, and heredity, all of which may affect the blood pressure. There is no dearth of drugs which theoretically will bring relief to the high-blood-pressure patient. One of the most important tasks facing investigators in this field today and for years to come is the evaluation of these drugs as to their long-range effectiveness, and the safety and practicality with which they may be administered.

Scientists at work

In this section we present several more specific examples of the type of research activity which has been carried on by investigators who are supported by the Heart Association research program. These brief samplings will serve to bring out more sharply the necessity and worth of these projects, and the practical promise of immediate and future benefits which they offer to heart sufferers.

Testing sex hormones.—In one research laboratory during the past year scientists were atempting to crack the mystery of why men are more susceptible to coronary heart disease than the so-called weaker sex. They had seized upon clues which seemed to show that the female sex hormone, estrogen, might be a factor protecting women from this disorder. It was found possible to arrest, and even reverse, the artery hardening process in chicks through the use of estrogen and other glandular products. In an effort to apply these findings to humans, other investigators were administering estrogen to male patients, and were attempting to determine whether this procedure would prevent a recurrence of coronary attacks.

Fighting shock.—Persons suffering severe heart attacks very often go into a state of serious collapse known as shock, in which the blood pressure falls

precipitously. For some years investigators and clinicians have been trying various means of combating this shock and restoring the blood pressure to normal as rapidly as possible in the hope of reducing the number of deaths from heart attacks. Two American Heart Association investigators have administered a blood pressure raising drug to patients who had suffered heart attacks and the results have been sufficiently encouraging to persuade them to continue the study.

Cutting heart valves.—One of the heart operations now well established is the reopening of the constricted mitral valve which has become scarred and narrowed as a result of rheumatic heart disease. Rheumatic heart disease also may scar and narrow the aortic valve, situated at the beginning of the main artery that conducts blood from the heart to the vessels supplying the rest of the body. Correction of this condition presents a much more difficult surgical problem because of the high pressure of the blood pouring through the aortic valve. Investigators are working to perfect a reliable technique for this operation.

Repairing heart holes.—Some persons are born with an abnormal hole in the wall separating the two auricles, or upper chambers of the heart. If this congenital defect is very large, it often leads to heart failure later on. One investigator has developed a hollow rubber cone-shaped well device which is inserted into an auricle and through which the surgeon can perform a deliberate, careful, and complete repair of this type of defect.

Seeking rheumatic clues.—In the rheumatic fever field, studies have been made on rabbits to learn more about a substance known as C-reactive protein, which may play a role in the development of the disease or which may give some sort of measure of rheumatic activity in the body. Investigators are also attempting to obtain a better understanding of the development of rheumatic damage to the heart so that they may in time be able to prevent or minimize such damage.

Aiding diagnosis.—Much work has been done on various types of a device known as the ballistocardiograph, a tool of great promise for research and possibly for clinical use in diagnosis of heart patients. The machine produces tracings which complement the information provided by the electrocardiograph.

THE JOINT RESEARCH PROGRAM

The national research support program of the American Heart Association is a joint undertaking of the national office and affiliated State and local heart associations. Into the national research program the national office places at least half of its 25 percent share of the total funds raised in the annual heart fund campaigns. A substantial portion of the balance retained by affiliated heart associations and their chapters is devoted to the financing of additional scientific investigations in their respective areas as part of their separate local research programs.

The 4-year record of research awards in both the joint national program and the separate local research programs of the affiliates is shown in the table on page 111. These represent the formative years of the American Heart Association as a voluntary health agency during which only limited funds have been available. Since the association began its national research support program in 1949, progressively higher sums have been allotted, making a total of almost $4½ million. The expectation is that much greater support will be given to cardiovascular research as the heart program advances.

Encouraging talent

The American Heart Association's research policy aims at developing a favorable climate in which research can move forward freely and continuously toward its goals. It strives to attract into the cardiovascular field the first-rate minds of skilled, imaginative scientists of proven talent and creative ability, and it tries to make it possible for these outstanding scientists to carry on their work without restricting pressures and without becoming too heavily burdened with teaching and administrative responsibilities.

Career investigator

The research ideal of the association is best demonstrated by the career investigatorship, created in 1951 as the first research position of its kind established in the voluntary health field for the encouragement of unrestricted, lifetime medical research. The career investigator receives an annual grant from the association throughout his productive career.

The first recipient of this new type of award, Dr. Victor Lorber, has transferred his research activities from Western Reserve University Medical School to the

University of Minnesota. Dr. Lorber is engaged in a study of chemical processes within the heart muscle. As funds permit, it is planned to create additional career investigatorships in the cardiovascular field.

Other research categories

Established investigatorships are awarded annually for a 5-year period to scientists of proven ability and superiority who are interested in a research career.

Research fellowships are granted for renewable 1-year periods to persons interested in research who plan to follow an academic career. They conduct their studies under seasoned scientific leadership.

Grants-in-aid are made to experienced investigators working in nonprofit institutions, medical schools, hospitals, and laboratories who have demonstrated their productiveness or who otherwise give promise of accumulating useful new information.

(A complete list and descriptions of association-supported research activities for the 1951–52 fiscal year may be obtained upon request from the medical director.)

4-year record of research awards by the American Heart Association and its affiliates

Fiscal year	National			Affiliates [1]	Annual grand totals
	Category	Number	Amount		
1951–52	Career investigator	1	[2] $25,000.00		
	Established investigators	15	89,750.00		
	Research fellows	23	101,900.00		
	Grants-in-aid	77	388,507.10		
Total		116	605,157.10	$990,500.00	$1,595,657.10
1950–51	Career investigator	1	[2] 25,000.00		
	Established investigators	10	55,000.00		
	Research fellows	24	90,650.00		
	Grants-in-aid	60	331,676.28		
Total		95	502,326.28	710,600.00	1,212,926.28
1949–50	Established investigators	4	23,500.00		
	Research fellows	28	101,246.99		
	Grants-in-aid	49	261,638.84		
Total		81	386,385.83	513,600.00	899,985.83
1949 (6 months ending June 30, 1949).	Established investigators	2	12,500.00		
	Research fellows	24	86,550.00		
	Grants-in-aid	19	123,382.70		
Total		45	222,432.70	477,500.00	699,932.70
4-year totals		337	1,716,301.91	2,692,200.00	4,408,501.91

[1] Estimated.
[2] This amount includes the career investigator's salary and funds for technical assistance, supplies, and institutional overhead.

NOTE.—Allocations for research in the national support program are made on a fiscal year basis. Funds allocated during a fiscal year come from the previous year's heart fund campaign, and are devoted to studies that are to be conducted during the fiscal year following the date of allocation.

AIDS TO THE MEDICAL PROFESSION

Medical research must be put to the use for which it is intended—helping human beings. To accomplish this, it is necessary to narrow the gap that often exists between an important scientific discovery and its actual application to save a life, to prevent or relieve suffering, to avert or lessen disability and waste.

Communications between the research scientist and the clinical physician who deals with sick people are being speeded up by the American Heart Association through the development of broad professional education programs. These programs provide practical information and tools to physicians and closely allied professional people, such as nurses, to help them deal more effectively with patients.

The annual scientific sessions and special activities of the various sections and councils of the scientific council are increasingly useful in bringing practical information to the medical profession. The national office produces and makes available a wide range of technical pamphlets, scientific journals and bulletins, manuals and guides, exhibits, teaching aids, films, pamphlets, and cardiac record forms. Among affiliated heart associations, the national office encourages the development of similar aids as well as conferences, seminars, institutes, postgraduate medical courses, nurses' institutes, and teaching courses in cardiovascular clinics, often arranged with the cooperation of local medical societies.

The clinic program

The cardiovascular clinic offers an opportunity for putting into practice the latest scientific knowledge through its diagnostic and treatment services. The clinic also plays an important role in rendering consultation services for physicians and in providing unique opportunities for professional education and research not only for physicians, but also for nurses, social workers, and other professional personnel. The American Heart Association has been working to maintain high standards of service to heart patients through its national committee on cardiovascular clinics, which includes representatives of clinics committees of affiliated heart associations throughout the country.

On the basis of experience with the clinic program during the past several years, it has been decided by the board of directors to discontinue the certification of clinics by the national organization, reserving this action for affiliated associations which are better able to observe conditions and to evaluate clinics in their own areas.

The national committee will continue to set general policies, advise the affiliates on matters of clinic certification, and maintain a national file of information to assist affiliates in establishing new clinics and maintaining standards. The association's guidebook, Recommended Standards and Minimum Requirements for a Cardiovascular Clinic, is being revised to conform with the new policies, allowing for the assumption of local responsibility in clinic development.

Scientific clearinghouse

The advance in the date of the 1952 scientific sessions proved highly successful, judging from the attendance and interest shown. For the first time the sessions, held in Cleveland in April, preceded the annual meeting of the American College of Physicians instead of the June meeting of the American Medical Association, as in previous years. Thirteen hundred physicians and scientists, representing a wide variety of disciplines, attended the sessions. Fifty-eight papers covered the latest experiences with new drugs, surgical procedures, diagnostic aids to the physician, and many other aspects of investigation supported by various sources in addition to the American Heart Association.

Heart interest at AMA

Although the scientific sessions were disassociated from the June meeting of the American Medical Association, the American Heart Association sponsored several features at the AMA event in Chicago which kept interest in cardiovascular matters at a high pitch. With the Illinois and Chicago Heart Associations, the American Heart Association cosponsored an exhibit booth and question-and-answer conferences. These were very well attended and won a special commendation from the AMA's committee on awards.

New research journal

Because of the expanding interest in basic research and the limited space available in existing publications for reports in this area, the need was felt for a separate publication devoted exclusively to fundamental studies. Responding to this need, the association initiated a new bimonthly journal, Circulation Research, as a companion publication to its monthly journal, Circulation. This was conceived as the first publication of its kind devoted exclusively to reports of basic research related to the heart and circulation. Dr. Carl J. Wiggers, director of the department of physiology, Western Reserve University School of Medicine, was named editor of the new journal, which began publication with the January 1953 issue.

"Circulation" adds features

Circulation, now in its fourth year of publication, continues as a monthly scientific journal devoting its contents more fully to clinical problems and applied research of more immediate interest to the physician in caring for his patients.

The clinical progress section, inaugurated in 1951, and clinical conferences, a bimonthly feature added last year, have increased the usefulness of this publication to the practicing physician.

"Heart Bulletin" for GP's

Heart associations have cooperated in helping to distribute the Heart Bulletin, a bimonthly magazine which began publication in March 1952 as a new medium for reporting the latest advances in diagnosis and treatment to the physician in general practice.

Teaching films needed

Development of the association's audiovisual program for medical as well as general education remained a serious problem because of high production costs, but it was hoped that up-to-date medical teaching films in the cardiovascular field as well as other needed new materials could be provided in the near future as funds become available. Meanwhile, the association's film library filled many requests from medical and nursing schools out of its limited supply of films and slides.

Rubber heart models

A popular visual aid in medical teaching developed and sold by the American Heart Association and its affiliates during the past year was a series of 10 new latex-rubber models of normal and abnormal hearts. These were particularly useful to medical schools and research institutes as well as to physicians in demonstrating heart conditions to patients and lay groups.

Setting cardiology standards

The association plays an important role in setting and maintaining standards of professional competence in cardiology. A committee of the scientific council, known as the Subspecialty Board on Cardiovascular Disease, provides the personnel and establishes standards for the examination of internists in the subspecialty of cardiology. The board conducts the examinations and reports its grades to the American Board of Internal Medicine.

During the past year, the subspecialty board also reviewed applications for approval of cardiovascular residency training in five institutions. The board offered recommendations on approval of these institutions to the Conference Committee on Graduate Training in Medicine of the American Medical Association's Council on Medical Education, which submitted the applications.

Registry of pathology

No account of the association's efforts to advance professional education and research would be complete without mention of its support of the Registry of Cardiovascular Pathology, which is connected with the Armed Forces Institute of Pathology. The Registry receives gifts of interesting records and pathological specimens in the cardiovascular field. It provides consultation service and has planned to provide teaching material for loan to students and physicians.

International meetings

Many association members attended the various cardiological meetings in Europe, Latin America, and other parts of the world in the fall of 1952. At the largest of these, the Fourth Inter-American Cardiological Congress in Buenos Aires in September, the association was represented by an official delegation of eight members, headed by Dr. Irving S. Wright, president. The association contributed toward the support of the Inter-American and the International Cardiological Societies.

To Work

EMPLOYMENT AND HEART DISEASE

Since economic pressures are so strong and so immediate in most cases of these chronic diseases, it is only natural that primary and increasing emphasis is being placed in program-building efforts on the need to keep the heart patient in his job, or to help him adjust to a different job more suited to his capacities.

This is an extremely complex problem. It involves the national defense program, business and industry, labor organizations, the farm, and the family, and requires a great deal of educational activity among the various groups concerned. Until now, the work capacities of heart patients have not been adequately utilized, mainly through ignorance of what they can do, and because of the too widely held belief that a heart ailment condemns a patient to a life of invalid-

ism. The fact is that the person with heart disease is not really handicapped in the literal sense when he works under the proper conditions. If he is selectively placed in a job that fits within his cardiac reserve, and receives proper medical supervision, continued employment is possible without harmful effect. A large number of cardiac patients can and do work, and many more are employable.

Through its cardiac-in-industry committee, the association has provided national guidance and materials to stimulate the establishment of local cardiac-in-industry committees and programs by affiliated heart associations and their chapters. In every community where the need is indicated, establishment of a work classification clinic is being encouraged as the facility best able to provide many of the services required to fit the cardiac comfortably in a job. The work classification unit is concerned with finding out the work capacity of patients referred to it, based on medical diagnosis; with evaluation of the patients' economic and family situation and their psychological attitudes; and with matching the patients' capacities to the various types of jobs for which they may be suited. The units are usually established as part of a cardiovascular clinic or they are set up at a rehabilitation center.

The original work classification unit set up by the New York Heart Association at Bellevue Hospital in 1941 is being used as a model by heart associations throughout the country. The experience of this unit was put into a guidebook entitled, "The Work Classification Unit." The American Heart Association is distributing this manual to help interested heart associations and other groups to organize and operate these valuable facilities.

Local cardiac-in-industry committees, established by heart associations to direct the employment and rehabilitation program in their areas, are composed of physicians, employers, representatives of labor and other interested agencies in the community. Besides organizing work-classification units and rehabilitation facilities where needed, they are sponsoring conferences on the problems of the cardiac worker and in many other ways are trying to arouse their communities to effective action.

Three-way attack

The educational efforts of these committees in urging the employment of heart patients has received strong support from the national office which published a series of booklets attacking on three levels the misconceptions that keep capable cardiacs out of jobs. The first of these booklets, Facts About Employment and Heart Disease, was planned primarily to correct the false notions and fears of cardiac workers and their families. The booklet cites research studies and industrial experience to show that "many heart patients can work at many kinds of jobs on an equal footing with workers who have no heart disease." The second booklet, These Hands Are Able, was designed to promote the employment of persons with heart disease by appealing to the economic interests of management and presenting favorable employment experiences. This booklet was adapted from a manuscript prepared by the cardiacs-in-industry committee of the Los Angeles Heart Association.

The third in the set, Returning Cardiacs to Work, is believed to be the first practical guide of its kind to aid physicians in their efforts to help the patient realize his full work potential. The manual includes a list of voluntary and private health agencies to which the physician may refer patients for vocational counseling or retraining. The medical staff of the Bellevue work classification unit prepared the guide, based on the unit's experience as a pioneer in the field.

Teamwork approach

Following the "teamwork approach" that is a fundamental part of its policy, representatives of the American Heart Association conferred with representatives of Federal agencies on the employment and rehabilitation needs of cardiacs. Local offices of these agencies and heart associations are being encouraged to work together on these problems.

HEART OF THE HOME

The housewife is entitled to no less consideration than the wage earner when she develops heart or circulatory diseases. Housewives with heart ailments outnumber industrial employees with similar conditions, if we accept the statement that these women constitute "the largest segment of the working cardiac population." The housewife with heart disease usually must go right on carrying her burden as mother and homemaker, despite the possible dangers involved.

That is why the Heart of the Home program has been developed by the heart association and its affiliates.

This program aims at simplifying work habits to lighten the load on the housewife's heart and help her guard against further heart damage. Some associations are conducting these activities as a phase of the cardiac-in-industry program. They are rightfully an integral part of the overall problem of rehabilitation.

Kitchen fame spreads

In the 4 years since the New York Heart Association developed a work-simplification plan and a model heart kitchen filled with labor-saving ideas for the cardiac housewife, many heart associations in other parts of the country have adapted the project under the guidance of the national office. Heart associations also have organized homemaker consultation services, classes, and demonstrations of methods for saving time and effort.

The fame of the Heart of the Home program has spread far and wide, with requests for program kits, slide films, and kitchen blueprints, coming to the national office from many foreign lands. The United States Department of Agriculture Extension Service has carried the Heart of the Home idea to housewives in rural communities where there are no heart chapters. Manufacturers of kitchen equipment, impressed by the need for simplification, have produced several of their items according to the specifications of the association. Utility companies have cooperated with heart associations by offering equipment and engineering help to build demonstration kitchens in which courses could be held to show women how to change their work habits for their heart's good.

The fact that much remains to be done in applying work-simplification methods to other home areas besides the kitchen is duly recognized. Several heart associations already are expanding their programs to include the home as a whole.

Varicose veins

The special problems of women with heart and circulatory diseases also were dealt with by the association in its publications program. Reprints of a Parents magazine article on Varicose Veins, a disease to which women are more susceptible than men, were made available for distribution to women's clubs, nurses' meetings, and to doctors to use with their patients.

RHEUMATIC FEVER AND SCHOOL PROGRAMS

Community programs designed to help heart patients work or otherwise function as closely as possible to the normal pattern often have developed out of the needs of children with rheumatic fever. Program activities to help these youngsters involve such comprehensive planning and so many agencies of the community, that a pattern is set for the creation of a rounded heart program in other areas of cardiovascular disease. Many associations have begun their general program-building efforts through this channel.

In addition to the scientific advances in prevention, described in the first part of this report, increased programs for rheumatic-fever patients have done much to reduce the ravages of the disease and contribute to the optimistic outlook in this field. The association is intensifying its efforts to develop complete programs to meet the needs of the young patients by drawing upon the various community services, agencies, and facilities that are required.

Summing up knowledge

Reporting on the progress being made in these programs, the association's new booklet, Heart Disease in Children, states, "As a result of rheumatic-fever programs, improved health services, and educational programs among parents, school people, social workers, and nurses, more children are brought to physicians in the early stage of the infection when it is most important that they be kept in bed under medical supervision." This new booklet provides an up-to-date summary of present knowledge concerning prevention and treatment of rheumatic fever, treatment of rheumatic heart disease, and the correction of congenital heart defects.

Another educational tool provided for the use of heart associations in their rheumatic-fever programs is Round Trip, a film originally produced for the Missouri Heart Association, which tells how various community agencies were instrumental in a boy's recovery and return to normal life.

With these and many other devices, heart associations are helping their communities make full use of all that has been learned about the prevention, diagnosis, and treatment of rheumatic fever.

Guiding local programs

A committee of the association's council on rheumatic fever and congenital heart disease is engaged in the preparation of a report based on a 2-year survey of rheumatic-fever programs. The purpose of the report will be to set out standards for the development by heart associations of rheumatic-fever programs that will assure proper services and facilities to patients. As another means of assisting heart associations in developing such programs, the association has continued a joint project with the Helen Hay Whitney Foundation, which maintains a clearinghouse and collection center for information on rheumatic-fever facilities and programs throughout the country.

Vigil in the schools

Because rheumatic fever ranks high as a cause of heart disease and disability among children of school age, an important part of a rheumati-fever program is the school health program. The school physician, nurse, and teacher may often play an important role in detecting new cases or recurrences, in referring the child to the family physician or clinic for treatmcnt, and in cooperating with the physician afterward in proper management of the child.

Some heart associations are promoting the routine examination of all school children entering the first grade as a measure of mass screening for rheumatic or congenital heart disease.

Several associations have sponsored the establishment of a cardiac case registry, a compilation of data on cardiac children and those suspected of having heart disease. This index provides a method of following the children through the school years, and is used to insure continuing medical observation and treatment where needed and to adjust education to the child's physical status when necessary.

Teaching the teachers

Special educational aids for teachers have been prepared by the national office, including a three-panel exhibit, The teacher and rheumatic fever, designed for use by heart associations at parent-teacher meetings, teachers' conferences, and in colleges. The message indicates the services a heart association offers in the child-health program, and is keyed to the association's booklet, What the Classroom Teacher Should Know and Do About Children With Heart Disease.

The American Heart Association joined with the National Education Association, the American Medical Association, and other voluntary health agencies in a Washington conference in the fall to work out methods of improving school health services.

SCREENING AND CASE FINDING

Direction of cardiac cases in the early stages is an important factor in assuring the most effective treatment. In this regard, heart associations are encouraged to make use of existing community facilities for case finding.

These existing facilities include joint programs that have been developed by health departments and tuberculosis associations for the early detection of TB. As an incidental result of mass X-ray screening conducted by these groups for tuberculosis detection, occasional abnormal heart shadows are found. Heart associations have been urged to take responsibility to plan cooperative procedures so that these suspect cases are appropriately referred for diagnosis and management.

To guide heart associations and other local groups involved, the American Heart Association called together representatives of the National Tuberculosis Association and the United States Public Health Service, and cooperated in preparing a joint statement on use of 70-millimeter photofluorographic films as a method of mass screening for heart disease.

DIET AND HEART DISEASE

Proper diet plays an important role in the prevention and treatment of several kinds of cardiovascular disease and has been found helpful to patients when started early. Low sodium diets, for example, have helped some patients with high blood pressure. It should be understood, however, that diet is by no means a cure.

To protect persons restricted to a low sodium diet, the association is concerned with seeing to it that foods are accurately labeled as to their sodium content so that the purchaser gets what he is paying for and is not harmed as a result of improper labeling. The association developed recommendations to serve as guidelines for the council on foods and nutrition of the American Medical Association and the Food and Drug Administration of the Federal Security Administration in devising regulations for the labeling of special low sodium dietary food products.

Diet manual

With the endorsement of the AMA's council on foods and nutritions, the Heart Association published Food for Your Heart, the first complete, low-priced diet manual in the heart-disease field. The manual is available to heart patients through a doctor's prescription. It incorporates nine diets, sample menus, the latest information on nutrition and heart disease, on reducing, and a plan for converting regular recipies into low sodium recipes to make eating for the heart patient interesting as well as safe and nourishing. Food for Your Heart was prepared under the supervision of a special committee of the American Heart Association, headed by Dr. Frederick J. Stare, chairman of the department of nutrition, Harvard School of Public Health.

Weight reduction

Although it isn't known exactly why overweight is so often associated with heart disease and high blood pressure, many doctors think reducing excess weight is good preventive medicine. In line with this thinking, the association cooperated with the Metropolitan Life Insurance Co. in its weight-reduction program, arranging for local showings of Metropolitan's film, Cheers for Chubby, and in other ways giving impetus to heart associations in tying in local weight-reduction programs. The association's film library made available Weight Reduction Through Diet, produced by the National Dairy Council, for showings to school and college classes.

POLICY ON PAYMENT FOR DRUGS AND MEDICAL CARE

From time to time requests are received by the Heart Association for direct financial aid to needy patients for medical care, hospital bills, and drugs. Heart Association policy requires that such requests be referred to the appropriate community agency already established to assist indigent patients. The Heart Association does not provide financial support for individual heart cases. It is the firm conviction that the program of research, community service, and educational activities represents the most profitable way heart associations can spend the limited funds raised through the system of voluntary giving for the greatest benefit to the approximately 10 million persons with heart and blood-vessel disease, as well as to the general public.

To Know

PUBLIC INFORMATION AND EDUCATION

So much attention is devoted to heart disease these days in the press, on radio and television, in the magazines, and increased booklet, exhibit, and film material, that it is difficult to realize how little such information was available to the public through these media only a few years ago, before the appearance of the American Heart Association as a voluntary health agency. The reason was a general apathy, fear, misunderstanding, and to a large extent the lack of an enterprising national organization and an active nationwide program in the cardiovascular field.

The changed situation and the altered attitudes of press as well as public have been greatly influenced by the planned public-relations policies laid down by the American Heart Association. This carefully conceived public-relations approach has exerted a strong effect in arousing public interest and winning the cooperation of the various press media in reporting on the increasing progress being made in the fight against heart and blood-vessel diseases.

As a voluntary health agency, the American Heart Association is dependent upon the full understanding and intelligent support of the public. Through its contributions to the heart fund, the public has a direct investment in the heart program, and therefore it has a right as well as a need to be kept informed of the latest scientific advances and community program developments. Because

of this concept of stewardship and obligation to the public the educational program is conducted as a year-round sustained effort.

The educational messages of the Heart Association are designed to stress accurate information without exaggeration or distortion; to correct misconceptions; to substitute encouragement and realistic hope for the fear and fatalism too frequently found in the past; to emphasize the scope of the cardiovascular problem and the belief that heart disease can ultimately be controlled through research; and to urge prompt and proper treatment of heart and circulatory disorders.

The health-education program is a dynamic effort to change people's behavior in relation to the cardiovascular diseases, encouraging them to accept the responsibility of acting upon the knowledge they receive. This action takes the form of self-help through consultation with a physician to obtain needed medical aid, and of community action through participation in Heart Association programs to develop the needed facilities and services for patients with heart diseases.

EDUCATIONAL MEDIA

Five facts

The core of the Heart Association's educational message is contained in a leaflet issued late in 1952 for general distribution in the heart fund campaign. The leaflet summarized as follows the Five Facts You Should Know About Heart Disease:

1. Some forms of heart disease can be prevented * * * a few can be cured.
2. All heart cases can be cared for best if diagnosed early.
3. Almost every heart condition can be helped by proper treatment.
4. Most heart patients can keep on working—often at the same job.
5. Your symptoms may or may not mean heart disease. Don't guess or worry. See your doctor and be sure.

Realizing the value of an educated public, more and more physicians are supplying their patients with educational aids produced by the Heart Association, in order to develop greater understanding and so assure their cooperation in following directions. Many kinds of materials are produced by the Heart Association to help doctors in the management of their cases. In this way, the doctor serves as a health educator, a service that is valuable in maintaining the basic patient-physician relationship and encouraging the patient to look to his doctor for guidance in medical matters.

See your doctor

See your doctor is an important theme of the Heart Association educational materials which seek to promote good general health habits as disease-preventive measures.

Several of the educational booklets for patient and general education produced by the association during 1952 have already been mentioned in the previous section because they are an integral part of specific kinds of community program development.

In another contribution to the education of heart patients and their families, the Heart Association cooperated with the public affairs committee in the production of the booklet, How to Live With Heart Trouble. This booklet helps cardiacs to avoid the trap of unnecessary chronic invalidism, and to enjoy full and profitable lives within the limits of their strength.

General-health precautions advised by five past presidents of the American Heart Association were contained in a cartoon-illustrated leaflet, Be Smart—Protect Your Heart. The illustrations were based on a poster series of Joe Palooka health cartoons contributed to the association by Ham Fisher. The Palooka health cartoons also were converted into TV film strips and newspaper mats.

Information rack services found in many industrial plants were an increasingly important aid in distributing general educational messages about heart disease. Numerous requests have been received for Heart Association educational materials from these services, which are an effective means of directly reaching the working population as well as management.

Untangling statistics

Booklets were prepared by the association for professionals and others concerned with informing the public, who require more detailed knowledge of the heart diseases. To clarify the tangle of statistical information available to

these people in the complex cardiovascular field, the association joined with the National Heart Institute in publishing Diseases of the Heart and Blood Vessels; Facts and Figures. This statistical handbook contains uniform statements and graphic charts based on official sources and agreed upon by the two major heart agencies. The information covers incidence, disability, importance of sex, and race, seasonal influences, and the most serious forms of cardiovascular disease.

You and Your Heart

The association arranged with the New American Library, publishers of Signet pocket books, to issue an inexpensive paper-covered edition of You and Your Heart, thus making available to a wider public the book giving detailed nontechnical information about the heart and circulation which was published by Random House in 1950.

The need for new films on heart disease for the lay public remained a primary one, and it is hoped that when increased funds become available this need will eventually be filled. The association's film library, established late in 1951, was increasingly active in handling distribution and servicing of films, slides, and film strips for rental or sale to affiliated heart associations and other interested groups for professional and general public screenings. The library acquired several new films produced by heart associations, and gaehered other useful films from various sources to add to its active collection.

Television opportunities

Television offered new opportunities to bring educational heart-disease films before a mass audience. Special television privileges were obtained for the films, Guard Your Heart and for a condensed school edition of that film, Wonder Engine of the Body. Several affiliated heart associations in various parts of the country also took full advantage of this new medium for telling the community about their program and the latest scientific advances in fighting heart disease.

Heart of America

In consideration of limited funds for production of audiovisual material, the association utilized an effective means for cutting costs by working with other agencies on a cooperative basis. For example, the Heart Association collaborated with the American Medical Association's bureau of health education in producing Heart of America, a series of thirteen 15-minute transcriptions which local medical societies are presenting jointly with heart associations. Each script features a dramatic story of one aspect of heart disease, and includes an informative message by a specialist in cardiovascular disorders.

The Human Heart

The Human Heart, a series of eight 15-minute transcribed stories of people who learned to live with heart disease, featuring leading entertainmnet personalities, was prepared under the joint auspices of the American Heart Association and the National Heart Institute. These programs also featured messages by heart authorities.

Posters and displays

Attention-getting but inexpensive poster material was much in demand by affiliated heart associations to inform the public about community services, program goals, and scientific advances. The national office developed a simple basic display unit consisting of a shadow box to hold various poster transparencies. Heart of the Home and school health exhibit posters also were made available. Through arrangements with other groups, specialized displays were provided to heart associations for use at professional meetings.

Stockholder's report

Special educational projects and meetings are developed by heart associations for particular sections of the community whose support is valuable in advancing the heart program. The association's council on high blood pressure research devoted its annual meeting last May to a stockholder's report outlining the latest developments in the cardiovascular field to a group of business and industrial leaders.

Clergy-physician committees

The clergy was enlisted in partnership with the medical profession to help provide spiritual and psychological guidance frequently required by heart pa-

tients in addition to the physical care of their physicians. The national office called upon heart associations to follow the lead of the Massachusetts Heart Association, which developed this program, in forming clergy-physician committees.

PUBLICITY AND INFORMATION

The publicity program of the Heart Association is part and parcel of its educational program, with the various media being utilized as vehicles to impart knowledge. Press releases are issued to newspapers, magazines, radio, and television, to medical and special publications, and to science editors and free-lance writers to acquaint the public and special groups with the problems of heart disease, the solutions that are being worked out, and the needs still to be filled.

In the interests of encouraging the highest standards of medical reporting and developing good working relationships with the press, the association cooperated to the fullest extent with editors, science writers, and broadcasters, providing them with authoritative information and helping them to prepare special articles and programs.

This mutual cooperation resulted in an excellent series of special articles, radio and television programs, and syndicated pieces throughout the year, reaching an educational crescendo during the heart fund period in February.

Blakeslee award

Stimulating further efforts in this direction, the American Heart Association established the Howard W. Blakeslee award in the amount of $1,000 to be presented annually to the "individual whose creative efforts have contributed most toward public understanding of the cardiovascular diseases in any medium of communication—including newspapers, magazines, books, radio, television, or films." The award was named in honor of the late science editor of the Associated Press, who died last year of heart disease.

Scientific sessions coverage

The tremendous interest of the press in following the latest scientific developments in the cardiovascular field is indicated by the extensive newspaper and magazine coverage of the association's annual scientific sessions. To encourage accurate and intelligent reporting of these sessions, authoritative material interpreting the scientific reports is made available to the press through the official information service of the Heart Association.

Research reporting project

The public's desire to know more about research activities and what they mean in the fight against heart disease prompted the development of a research reporting project. A science reporter representing the association has interviewed research investigators in various parts of the country concerning representative studies and trends. He has completed a report which will be published in 1953. The material collected for this report already has proved useful in counseling editors and writers, in providing reference information and photographs, and in the preparation of a series of newspaper feature articles on research.

Publicity manual

In the same manner that it develops guidance material for the use of affiliates in their educational and community service programs, the national office also provides assistance to heart associations in conducting their publicity activities in a manner consistent with the public relations policies that shape the national program. The national office prepared a publicity manual for heart associations, as a practical guide to affiliates and chapters in using all publicity media. The manual places stress on specific problems related to the heart program and coordination of national and local publicity efforts for maximum effectiveness.

The American Heart

Supplementing other media of education and information, the American Heart Association and its affiliates issue their own periodicals to give a regular accounting to the general public of work planned and accomplished. The American Heart, a national quarterly, is distributed by heart associations to members, contributors, the press, and other key community leaders and groups to acquaint them with the general objectives and progress of the heart program. The quarterly is utilized in combination with statewide and local newsletters and

bulletins issued by heart associations as a direct informational channel to tell the public what we are doing.

Mounting inquiries

An increasing load has been placed on the inquiries section during the past year because of the expanding activities of the association and its affiliates and the growing awareness among the public of the services available to fight heart disease. This was reflected in the steep rise of inquiries and requests for information, educational materials, and many other forms of help from a wide variety of individuals and organizations, including the press.

To Help

ADMINISTRATION AND ORGANIZATION

The American Heart Association and its affiliated associations and chapters constitute a democratic and voluntarily established structure to help the physician, the heart patient, and the public combat heart disease. During the past year, a series of reorganizational moves was begun in order to achieve greater streamlining and efficiency in this structure, and a more democratic participation of members and leaders.

The national office of the association directs the national phases of the heart program and guides affiliated associations in the development of its community aspects, providing a clearing house and a source of information, ideas, and materials. Although a great deal of attention is still required from the national staff in helping affiliated associations strengthen their organizations and develop new chapters, the point has been reached where much more emphasis can now be placed on program building.

Affiliates and chapters

The network of heart association affiliates and chapters has extended its geographical coverage so that there are organizations in almost all of the 48 States as well as Puerto Rico, Hawaii, and the District of Columbia. By the end of 1952, there were 59 directly affiliated heart associations, constituted for the most part on a statewide basis, with 351 chapters under their jurisdiction. There were also a good many local heart committees which will become chapters at a later stage of their development.

These heart associations have a total of approximately 14,800 voting members, of whom 7,800 are physicians, and 7,000 laymen. Voting membership in an affiliated association is open to any person interested in supporting or participating in the heart program, and automatically entitles an individual to voting membership in the American Heart Association. Membership subscriptions to the scientific journals published by the association are separate from voting membership.

National assembly

The national assembly is the overall governing body of the American Heart Association, composed of approximately 400 delegates representing affiliated heart associations and the various councils and sections of the national organization. A result of the broader geographic coverage by heart associations was the abolition late in 1952 of the general category of assembly delegate at large. The delegate-at-large category originally was created to represent unorganized areas of the country.

A record attendance marked the annual assembly meeting in April 1952 in Cleveland as a result of several new program features that were added to interest lay members. These features included Doctors Meet the Press, a panel discussion, and Your Heart Association in Action, presenting progress reports by physicians closely associated with heart association programs.

Scientific council reorganizes

The tremendous and growing interest of physicians throughout the country in participating in the scientific and medical program of the Heart Association set the wheels in motion for a reorganization of the scientific council to broaden its membership, and bring about wider representation of all interests in the medical profession. Steps were taken to revise the council's rules and regulations in keeping with the decision that "all medical members of the association and its affiliates" may become members of the scientific council. Organization of two new sections was begun, a section on clinical cardiology and a section

on vascular surgery. The scientific council already includes the section for high blood pressure research, the council on rheumatic fever and congenital heart disease, and the section on circulation.

Blood pressure section transfers

The office of the section for high blood pressure research in Cleveland has been closed as part of an integration process within the framework of the American Heart Association. Functions relating to medical and program matters have been transferred to the national office under the supervision of the medical director. The section's fund-raising activities among corporation executives have been transferred to the Cleveland Area Heart Society.

Community service and education council

To place greater emphasis on developing programs of community service and education, the association's board of directors approved the creation of a council on community service and education, which is to have the same responsibility in these areas as the scientific council exercises over research and professional education. Creation of the new council was recommended by a special committee on staff function, appointed by the President to study the duties and responsibilities of national staff members, and their relationships to committee, council, and board activities.

Staff organization

The board also adopted a plan of organization for the national staff, submitted by the executive director, Rome A. Betts. This plan provided for the medical director, Dr. Charles D. Marple, to administer the research and professional education program, supervise the medical content of all publications, and be responsible for conducting the annual scientific sessions, with staff responsibility for all activities of the scientific council and its councils and sections.

Conforming with the creation of the new council, the title of the public health director, Dr. John W. Ferree, was changed to director of community service and education. The public health division for which he is responsible, became the community service and education division. Functioning within this division are the staffs for field program consultation, public information, educational materials, and inquiries.

Guiding affiliates

Consultation and guidance are provided to help affiliates improve their operations through field visits of national staff members, national training sessions, orientation visits of new heart association staff members to the national office, regional conferences, and special memoranda and interassociation publications. The process of coordination as well as guidance is an important one to assist affiliates in developing their activities to the fullest potential. The committee to review and coordinate the activities of affiliates evaluates annual reports received from heart associations covering administration and organization, program, and finances, and makes recommendations to help them with their problems.

Staff conference

The staff conference of heart associations, an organization composed of executive directors and staff members of affiliates and chapters, exercises an important function in interpreting the policies of the national office to State and local groups, and in making better known the needs and desires of heart associations to the national organization. During 1952, a broader participation by repesentatives of the staff conference was brought about in the policy and program-making bodies of the national asociation to the benefit of the overall heart program.

With the assistance of the national office staff, the staff conference of heart associations conducted a 3-day conference preceding the annual meeting of the American Heart Association in April 1952. This conference has now become an annual event, offering an opportunity for mutual assistance and helpful exchange of program ideas and experiences.

Regional meetings

Getting closer to the problems peculiar to various geographical areas, the national office held 6 regional meetings for Heart Association board, committee members, and staff representatives from 36 States and the District of Columbia.

Program guide

The association's new Program Guide proved a valuable supplement to the consultation services of the national office in assisting heart associations to build programs corersponding to the needs of the people of the community. Heart and Torch, an interassociation bulletin, was a continuing source of new ideas and suggestions for program building.

New address

A further step toward economy and efficiency of operation was taken when the national office in New York was consolidated on one floor at a new address, moving from 1775 Broadway to 44 East 23d Street. The move, made necessary by the growth of program activities, gave the association about double the amount of space at no increase in rental.

Gold heart awards

The Heart Association feels it is appropriate to reward those who have rendered particularly outstanding service to further the heart program or to aid in scientific advances. The association's top honor, the annual gold heart award, was presented at the 1952 annual meeting to A. W. Robertson, Pittsburgh, for his leadership as chairman of the board of directors from 1948 to 1952; Dr. Carl J. Wiggers, professor and director of the department of physiology, Western Reserve University School of Medicine, Cleveland, in recognition of his influence on medical thinking and his unique school for research investigators; Robert L. Mehornay (posthumously), business and civic leader of Kansas City, Mo., for his contributions to the development of the association as one of its first lay members of the board; and Mrs. Albert D. Lasker, cofounder of the Albert and Mary Lasker Foundation, for focusing attention on the need for medical research on heart and other diseases.

THE HEART FUND

The heart fund campaign, in which the public is asked for voluntary contributions every February, is the chief source of income to help heart associations continue and develop their programs of scientific research, professional and public education, and community service. Additional sources of funds are memorial gifts, legacies, and bequests, and other year-round donations.

The 1952 heart fund campaign, fourth of the association's national fund-raising efforts, reached the highest total yet attained. The successful results of the 1952 drive were viewed as a heartening expression of increasing public confidence in the voluntary program to combat heart diseases. The association was "coming of age," not only in the scope and importance of services performed, but in the public's willingness to give financial support to its activities.

Here is the 4-year record of heart fund receipts:

1952 campaign	$6,582,132.50
1951 campaign	5,551,266.57
1950 campaign	4,104,484.82
1949 campaign	2,655,777.00

Leadership

The heart fund was fortunate once again in being able to count on the advice and counsel of distinguished leaders in various fields of business, industry, Government, labor, and the professions. Bruce Barton, noted author and chairman of Batten, Barton, Durstine & Osborn, served for a second year as national campaign chairman. Assisting him as vice chairman was Charles E. Wilson, president of General Motors Corp. Winthrop W. Aldrich, chairman of the Chase National Bank, served as campaign treasurer. Postmaster General Jesse M. Donaldson was chairman of the Federal Employees Committee. Secretary of Labor Maurice J. Tobin was chairman of the Labor Committee. Thomas M. McDonnell, director of radio for Foote, Cone and Belding agency, served as chairman of the Radio Committee. Rodney Erickson, manager of the radio and TV department, Young & Rubicam, Inc., was chairman of the Television Committee.

Publicity aids

During the campaign period an intensive effort was made to supply all media of communication with publicity material about the heart program and heart disease both at the national and community level. The national office provided

a continuous flow of educational news and feature releases concerning current developments for national press, radio, and television and for local adaptation by heart association affiliates. In addition, editorials, photographs, special-feature articles, mat sheets, and logotypes were supplied for local use in newspapers, and in special periodicals such as business, advertising, trade, labor, and industrial publications. National magazines scheduled heart-disease articles, editorials, and heart fund announcements to coincide with the February campaign period.

The national office also prepared and distributed radio and television spot announcements, transcription records including appeals by prominent figures in public life and the entertainment field, television films, and slides. Special kits for local radio and television outlets contained prepared talks, and scripts for interviews, and round-table discussions.

Guidance material was sent to affiliates in the form of instructional handbooks, fund-raising manuals, and campaign memoranda. In addition, numerous fund-raising aids were prepared by the national office, including campaign pamphlets, posters, car cards, taxi stickers, lapel tags, milk bottle collars, matchbooks, school coin cards, and plant and office solicitation scrolls.

A great deal of assistance was given by the national fund-raising consultant staff to heart associations and campaign leaders to further their efforts.

Memorial gifts

Gifts made to the heart association in memory of a relative, friend, business associate, or fellow club member who has died of heart disease now constitute an increasingly important factor in the total income. To assist donors who which to make such gifts, a special card of acknowledgment is sent to the family of the person honored, and a receipt is sent to the donor.

Legacies and bequests

Legacies and bequests to the heart fund continue to increase in number and amount. Persons who wish to name the association as beneficiary in their wills may use the following form:

"I give and bequeath to American Heart Association, Inc., a corporation organized under the membership corporations law of the State of New York and having its principal office at 44 East 23d Street, New York 10, N. Y., the sum of _____ dollars to be used for the general purposes of such corporation."

A similar form may be used in naming any affiliate or chapter as beneficiary, substituting the corporate name and address of the State or local association for that of the national organization. It is best, however, to check with your local heart association, and your attorney, since laws in the various States differ slightly.

Funds may be bequeathed for specific program purposes. It is suggested that persons wishing information about such bequests telephone or write the American Heart Association or their own local heart association.

AMERICAN HEART ASSOCIATION, INC. (NOTE 1)

Balance sheet—June 30, 1952

ASSETS

General fund:		
Cash		$221,469.12
Investments—		
U. S. Government securities (principal amount $459,000) at cost	$457,669.26	
Cash surrender value of life insurance policy	58,768.61	
		516,437.87
Due from affiliated associations—		
Advances for organization expenses	97,389.00	
Campaign contributions	833,405.05	
Campaign materials	28,053.20	
		958,847.25
Inventory of campaign materials, etc		84,275.49
Other receivables, prepaid items, etc		29,008.57
		1,810,038.30
Less—Amount transferrable to the research fund as unremitted campaign contributions ($833,405.05) are received from affiliated associations		438,477.52
		1,371,560.78
Research fund:		
Cash	$155,659.37	
U. S. Government securities (principal amount $1,000,000) at cost	998,587.84	
Transferrable from general fund (portion of unremitted campaign contributions, as above)	438,477.52	
		1,592,724.73
Special and restricted funds:		
Cash	26,120.53	
U. S. Government securities (principal amount $55,500), at cost	55,289.75	
		81,410.28
Total		3,045,695.79

LIABILITIES AND FUND BALANCES

General fund:		
Accounts payable—		
Due to affiliated associations		48,369.15
Due to others		31,083.37
Fund balance (see accompanying statement)—		
Contingency reserve (note 3)	$140,684.63	
Balance available for campaign expenses and for operating expenses, including all costs of administering the research funds of the association, and rheumatic fever and high blood pressure projects, budgeted for the fiscal year ending June 30, 1953	1,151,423.63	
		1,292,108.26
		1,371,560.78
Research fund (see accompanying statement):		
Contingency reserve (note 3)	179,650.40	
Unexpended balance of awards made for research grants-in-aid and fellowships	604,300.60	
Balance available for allocation to research projects	808,773.73	
		1,592,724.73
Special and restricted funds (see accompanying statement): balance		81,410.28
Total		3,045,695.79

Statement of general fund for the year ended June 30, 1952

General operating fund:			
Balance, June 30, 1951			$1,029,285.57
Income (note 2):			
Share of 1952 contributions (including $96,272.74 of gifts designated for research, rheumatic fever, and high blood pressure)		$1,624,538.21	
Less—			
Amount reserved for research	$843,117.33		
1952 campaign and fund raising expenses, other than expenses of fund raising division of the national office, deducted below	97,237.28		
Allocation to contingency reserve (including bequests of $5,684.63)	30,684.63		
		971,039.24	
		653,498.97	
Interest		5,956.93	
Other (net)		538.50	
			660,004.40
			1,689,379.97
Expenditures:			
Medical		108,991.50	
Public health		77,194.19	
Public information and education		115,160.14	
Fund raising division—national office		53,704.37	
Organization and development of local heart associations		56,502.41	
Administration		126,403.73	
			537,956.34
Balance, June 30, 1952			1,151,423.63
Contingency reserve:			
Balance, June 30, 1951			125,000.00
Allocation from general operating fund (including bequests of $5,684.63)			30,684.63
			155,684.63
Less—Cost of special research reporting project			15,000.00
Balance, June 30, 1952			140,684.63

Statement of research fund for the year ended June 30, 1952

		Available for allocation to research projects	Awards made for research grants-in-aid and fellowships	Research contingency reserve (note 3)
Balance, June 30, 1951		$603,315.94	$475,650.12	$106,637.44
Add:				
Amount reserved from 1952 campaign proceeds	$757,430.77			
1952 contributions designated for donors for research	85,686.56			
		843,117.33		
Interest received on investments		18,349.44		
Refunds of unexpended balances of grants and fellowships		23,578.37		
		1,488,361.08	475,650.12	106,637.44
Transfers:				
Amounts awarded for research grants-in-aid and fellowships, payable in installments, generally within 1 year from date of award		(605,157.10)	605,157.10	
Allocation to research contingency reserve (including bequests of $48,012.96)		(73,012.96)		73,012.96
		(678,170.06)	605,157.10	73,012.96
		810,191.02	1,080,807.22	179,650.40
Deduct payments made during the year on grants-in-aid and fellowships		1,417.29	476,506.62	
Balance, June 30, 1952		808,773.73	604,300.60	179,650.40

Statement of special and restricted funds for the year ended June 30, 1952

	Total	Samuel H. Kress fund	Julius William Hampil foundation	Lewis A. Conner lectureship fund	Committee on anticoagulants	ATCH cortisone rheumatic fever study	American Trust Co. donation for Inter-American Cardiological Conference
Balance, June 30, 1951	$103,168.91	$25,053.95	$7,367.86	$6,058.93	$18,379.56	$46,297.71	
Contributions and grants received	45,346.10	25,000.00	5,846.10		8,500.00	3,500.00	$2,500
Interest received	639.69	96.69		137.50		405.50	
	149,153.80	50,160.64	13,213.96	6,196.43	26,879.56	50,203.21	2,500
Expenditures	67,743.52	19,774.42	6,504.82	100.00	21,356.17	17,508.11	2,500
Balance, June 30, 1952	81,410.28	30,386.22	6,709.14	6,096.43	5,523.39	32,695.10	

The accompanying notes are an integral part of this statement.

NOTES TO FINANCIAL STATEMENTS

(1) The accompanying financial statements reflect only the accounts of American Heart Association, Inc., and do not include the accounts of affiliated associations which are maintained individually by such associations.

(2) The 1952 campaign collections reported by the affiliates together with contributions received direct by the association aggregated $6,582,132.50, of which $1,624,538.21, approximately 25 percent, has been allocated to the association and is reflected in these statements. The amount of $97,237.28 deducted therefrom represents expenditures by the national office applicable to the conduct of the 1952 campaign.

(3) The general contingency reserve and the research contingency reserve were authorized by the board of directors, for the purpose of setting aside, over the years, funds for the continuity of the association's general activities and of its scientific research program, and to meet emergency demands. These amounts may be utilized only by specific action of the board of directors.

AUDITOR'S CERTIFICATE

To the Board of Directors, American Heart Association, Inc.:

We have examined the balance sheet of American Heart Association, Inc., as of June 30, 1952, and the related statements of general fund, research fund, and special and restricted funds for the year then ended. Our examination was made in accordance with generally accepted auditing standards, and accordingly included such tests of the accounting records and such other auditing procedures as we considered necessary in the circumstances.

In our opinion, the accompanying balance sheet and statements of general fund, research fund, and special and restricted funds present fairly the financial position of American Heart Association, Inc., as of June 30, 1952, and the changes in the respective funds for the year then ended, and were prepared in conformity with generally accepted accounting principles applied on a basis consistent with that of the preceding year.

New York, N. Y., December 16, 1952.

ARTHUR ANDERSEN & CO.

Mr. HESELTON. Some reference was made to the international meeting in Buenos Aires and one I believe to be held here next year. What is the situation in other countries like Canada, Britain, and the European countries?

Mr. BETTS. There is only now beginning to be developed interest in the development of a heart association in Canada. There is one that has been actively launched in Ontario, but that is the only potential association that I know of in actual existence up to now.

Heretofore the Canadian medical profession has had a strictly scientific group interested in heart disease in much the same manner that our American Heart Association was up to the time of its reorganization in 1948, but there has been this recent beginning in Ontario. In the case of England I believe that there is no activity in the voluntary agency field.

Dr. WRIGHT. I should like to say that there are heart associations in most of the countries of South America and in most of the European countries developed to varying degrees, but for the most part they are purely scientific bodies consisting of doctors who compare notes, give their papers, and are interested in the publication of the journal, but which do not for the most part develop in any way like the American Heart Association has developed in the last decade. Actually, they are watching us very carefully and I believe with the reports they get in some areas they are going to be moved similarly.

Mr. HESELTON. I think some reference was made this morning to the dissemination of information back and forth between various countries. I believe it was this week that there was a very interesting editorial in the Christian Science Monitor commenting on a report made by the United Nations criticizing very definitely our lack of exchange of scientific and cultural information between this country and other countries, and commenting on the development of the atomic bomb partly through discoveries made in other countries. I do not suppose you happen to have seen that editorial or the report, but do you think that there is the fullest exchange of information?

Dr. WRIGHT. I do not think you can say it is developed to the fullest, since we even have difficulties with communication in a very small area sometimes, but it is moving rapidly and steps are being taken to increase that in terms of the inter-American and international heart associations.

Mr. HESELTON. That is all, Mr. Chairman.

The CHAIRMAN. Any further questions, gentlemen? I believe that will be all. Dr. Duckett Jones, did you have something to add?

Dr. JONES. I would like to say that early this summer I was invited to Canada to speak to a group of the heart association people who are interested in the beginning of plans where they will have both Government and private funds for cardiovascular research. They apparently are going to go ahead and hope it is very effective in the near future.

Dr. WRIGHT. Mr. Chairman, since time is marching on if I may I should like to ask the 3 men representing 3 major areas within a period of about 3 minutes each to mention briefly what they consider to be the main weaknesses in their particular areas in terms of their information at this time; and if they can, to suggest some direction of approach. Then we will summarize by our recommendations.

The CHAIRMAN. Before we proceed with that, did you have a question you wished to ask, Mr. Heselton?

Mr. HESELTON. No. I wanted to ask the previous question to see if anybody thought there were any weaknesses.

Dr. WRIGHT. If I may I will ask Dr. Wilkins first to outline very briefly what he considers to be the 2 or 3 real loopholes and major weaknesses in the problem of dealing with hypertension.

STATEMENT OF DR. ROBERT W. WILKINS, VICE PRESIDENT OF THE AMERICAN HEART ASSOCIATION, MASSACHUSETTS MEMORIAL HOSPITAL, BOSTON, MASS.—Resumed

Dr. WILKINS. I am not sure these weaknesses deal only with the field of hypertension, but for what they are worth I would see them as follows: It seems to me we are prone to have the impression, largely from the oft-repeated references here to the atomic-bomb project, that results come from the urgency of the need for the results on the one hand and the amount of money that is put into it on the other. Whether that is true in the atomic-energy field or not I am not qualified to speak to, but I am absolutely certain that is not true in the medical field. A problem may be terribly urgent; you may pour great amounts of money into it; but that does not equal the answer.

Secondly, one of the points that I think ought to be emphasized in an introductory way is that we speak continuously of basic research and yet, being practicing medical men, we have to deal with the practical aspects of doing the best for the patients at the time that we can with what we have available. This has two effects so far as research is concerned. It makes us emphasize the practical or treatment aspects of the disease. That is particularly pertinent to hypertension, when we do not know its cause and we are really groping in the dark as to the proper methods of treatment.

I would say that that feeling has dominated the research that has been done in the hypertension field in the last several years. I, myself, have been active in it and guilty of it; namely, that we felt that treatment was so urgently needed that we have devoted a great deal of time to treatment and as a consequence we have perhaps left undone some of the basic research that could be done and needs to be done as to cause or mechanisms, if you will.

So I would put No. 1 on the list, so far as hypertension is concerned, the need for more research people to dodge, if they can, the intimate and practical necessity of treating patients with drugs or what have you in order to have time to try to get behind what causes the disease.

Now, as the corollary to that weakness it seems to me you have implied there the need for training of people in the basic sciences in this connection, and then you come hard up against the possibility of where are you going to get the people and where can you train them? This hits into the hard fact, so far as I am concerned, of the needs of medical education.

I do not want to deviate from my subject except to insert for the record, Mr. Chairman, that medical education today, in my opinion, is in a crisis situation and that something has got to be done or the recruits from which we in the research field hope to draw new material in terms of young, bright minds equipped by training to do the work that needs to be done will not be available to us in the proper quantities.

Dr. WRIGHT. Dr. Wilkins, I am sorry to interrupt; but please illuminate the committee on why you consider medical education to be in a critical state at this moment.

Dr. WILKINS. Well, I consider it to be in a critical state because of the medical schools, all private medical schools—that is, those not supported by State governments—being financially badly in the red and having been so for a number of years. They are losing propositions.

In my own university the medical school spends far and away more money than any other department of the university and does not even pretend to meet from its tuition income the costs of medical education; and the university has told us frankly that this can go on for a few years, but it certainly cannot go on indefinitely. That is just one medical school, but I know it is not unique. It is country-wide.

Where you have State or Government support of some kind that situation is not as critical.

Now, speaking for my own school, we would like very much to expand our school for the public good, to educate more doctors, to educate more research workers, and to get more people to draw on. We cannot do this under the financial situation in which we now exist.

There is another and very complicated problem, Dr. Wright, but it is intimately tied up with what I consider to be the great weakness in my field. Now, that is men. Assume that you have the men. And we do have more men now who would like to go into research than we could accommodate. Why is that? This is the second weakness.

There is not the money to build the laboratories and equip them for these men who are available to work in them. Well, you say, "That means you can pick off the cream." Yes, but you are not always certain you are picking the cream of the young men who come along. Every day I interview youngsters who seem to be bright and up and coming and have their hearts in this. I have to say: "I am sorry; there is only one position available next year. Obviously it is on a competitive basis and we will pick the best man."

For that reason I think the even more crying need at the very moment is for more space to put the men to work in that we could get today if we had the space to put them in.

Now, there is one other thing that comes back to the point about medical schools that I am not sure everyone appreciates in this connection and that is this: Assume that we build an institute in the medical school to do research. You have to do more than build the institute and support the local research in order to make it not a losing proposition for the medical school to allow it to go on, because the facts of the matter are that the administrative costs of bearing this adjunct, if you look at a medical school, are quite out of proportion with the 8 percent which I believe is the usual overhead figure that is given in research grants awards; so that the medical schools have gotten themselves into the bad situation of not being able to live without research money, and they are going into the red more heavily the more research money they take.

I do not know what the solution to this is, but if medical research is going to continue as it has in the past to be centered largely—I am not saying totally or that it should be totally—around medical schools, schools of medical education, then I believe our most crying need is to do something to relieve the medical schools and to get them on a sound economic and businesslike operating budget and something that will pay its way at least as it goes.

I do not think anyone proposes to make money out of medical education.

I would say those are the great needs.

Dr. WRIGHT. I think Dr. Wilkins has really expressed what has been in the minds of all of us. Perhaps he has picked the great needs with reference to the other specialties, too, so I will ask the other two speakers not to repeat these statements, since I am sure they are in agreement. If they disagree they may state so. But if they wish to add to them, taking up some other aspect of the particular fields, I should like to be able to call on them if I may, sir.

Dr. Jones?

STATEMENT OF DR. T. DUCKET JONES, MEDICAL DIRECTOR, HELEN HAY WHITNEY FOUNDATION, NEW YORK CITY—Resumed

Dr. JONES. I would like to clarify one of Dr. Wilkins' remarks.

I am sure it is absolutely true that the amount of money and the direct relationship to returns in relation to knowledge is not possible, but I hope you did not mean by that that more funds were not needed.

Dr. WILKINS. No. I am sure you do not get knowledge without funds.

Dr. JONES. I would agree with the remarks he has made with that change and emphasis; and I would like to add 1 or 2 more things.

I think that we have done up to now a really inadequate job. I am not criticizing anyone. I mean this is what has developed in the last few years. It is inadequate in the way in which we give continuity and stability to those workers who have shown themselves worthy, by the repetitive nature of the short-term grants, which are very disastrous to any operating research group; and I think we have not yet developed a satisfactory program whereby we can be certain that we are getting the very best potential personnel for research and utilizing them well. I think that is the key for future expansion, and that something could be done.

There is one other feature that I think Dr. Wilkins intended to stress very heavily, and that is that this is a question, as far as rheumatic fever is concerned, of the point of weakness in the present direction of attack. It makes me think of the fact that I certainly do not know the answer to rehumatic fever. I serve on a good many boards. I would hate to think that in serving on any research fund committing group that I did so with the thought that I voted "yes" on a given grant because it was going to give the answer to the rheumatic-fever problem. All I can do is express faith and confidence in the very able workers who have or possibly can contribute to knowledge.

Hence I think that there is very grave danger in limiting the number of fund-granting agencies for medical research to any very limited group of human beings or agencies. In other words, the freedom of scientific inquiry is greatly heightened when the authoritative control of the acquisition of knowledge is put in multiple agency or group hands rather than concentrated in a single authority, because no one is divinely ordained in this respect, and unless he were he could not predivine what was coming from any given grant.

I think it has been obvious from this discussion today that there are a number of agencies which are vitally interested in getting increased funds from the private individuals of this country; in getting, if possible, an increased volume of high-quality research; and in insuring that they are and will be spending funds well.

There are also multiple sources within the Government agencies. I am sure not only the Public Health Service, which has been concentrated upon today, but others have some interest in this field. I hope that there will be no grouping of everything under one single pattern of administrative control because when we do that then we obliterate the opportunity for the little-known person, and he may be the man who is going to bring us possible knowledge of great importance for the future.

Dr. WRIGHT. Thank you, Dr. Jones. Dr. Andrus?

STATEMENT OF DR. E. COWLES ANDRUS, JOHNS HOPKINS UNIVERSITY, AND PRESIDENT-ELECT OF THE AMERICAN HEART ASSOCIATION—Resumed

Dr. ANDRUS. Well, speaking of the field of arteriosclerosis I think there are two great needs at present. First is a means of diagnosing the disease before the accident, such as a heart attack, which is a consequence of the disease cripples the individual. To put it another way, some means of characterizing those individuals who have atherosclerosis and are liable to these accidents.

In the second place, there is the need to gain some means of affecting the progress of the disease, to slow it down or to stop it.

Now, that problem shares with all the other problems that have been mentioned today in the need for new knowledge, and that means research. If we sound insatiable in our desires for more funds, there is a limit, of course, to what can be fruitfully employed, but there is a real need to collect the brains that can do this job, to create a favorable climate of opportunity for the younger, more imaginative investigators in the field. When a man demonstrates that he can do this work and that he can be productive, do not make him peddle

his idea from year to year in order to get a grant that he has to work to renew a year from now, but give him stability and continuity of resources so that he can forget that phase of the problem long enough to get on with his job. That, I think, is an essential.

Thank you.

Dr. WRIGHT. I think that we have largely concluded what we had in mind in terms of our outline. The recommendations have been made as we went along. We would be glad to try to answer any questions of the committee, sir.

The CHAIRMAN. With reference to this last phase of the testimony, Dr. Wilkins emphasizes the inadequacy of support for medical education, the thought that was expressed by Dr. Jones was as to the necessity of having some assistance diversified, and there was the point you have just made, Dr. Andrus, about emphasizing stability and continuity of service or help; and those questions are not new to this committee. In our study of the inadequacy of physicians, from the standpoint of numbers—I am not speaking otherwise—the committee has been made aware of some startling information in that respect. I remember a statement made before us in one of our hearings not too long ago that there were not appreciably any more men being graduated in medicine today than at the commencement of this century. That struck me as a rather unusual situation. There was some explanation that was made of it, however, by saying that in the early part of this century the tests and the types of college were not the same as they are at the present time; that at that ime there were colleges in existence which were issuing licenses very quickly and not with the consideration which now prevails; and that that had something to do with the large number who entered the practice of medicine at that time as compared to the present.

Now, with respect to a lack of hospitals, this committee gave consideration to that subject. This committee originated the Hospital Construction Act which, so far as money has been appropriated to it, has done a pretty good job, particularly in its benefit to communities which were not able to build hospitals. We have left that very largely to the States to determine, as to where the money which comes from Federal sources should be expended.

I mentioned what has been referred to by Dr. Wilkins and Dr. Jones and Dr. Andrus as a matter that this committee has given consideration to and will continue to give consideration to. It is a very serious matter.

When you come down to the inadequacy or insufficiency of physicians, you run across the fact that after a physician has gone through several years of preparatory study, including college as well as the medical school, that it has brought him along pretty well in life and has cost him a great deal of money, and the tendency is to practice where there will be a return commensurate with the time preparing and the expense incident to it, with the result that we find doctors very largely gravitating toward urban centers rather than to rural areas. Therefore, we have figures with respect to the number of doctors in New York or Philadelphia or places of that size and even less that are astounding when you compare them to the number of physicians in some localities in different parts of the United States, and particularly the rural districts.

So there are a lot of problems connected with this, and I should like to assure you gentlemen who have rendered such a great service to us today in coming here at such great inconvenience to yourselves that this committee is conscious of a lot of these problems and is endeavoring to give them its best consideration with the hope that some day maybe we will be able to give the relief that so many of us feel should be granted.

Dr. Wright, speaking to you and to each of the others who has appeared here today I do not know how to find words which will adequately express our feelings of thanks and appreciation to you and those who have assisted you today in presenting this matter to this committee. You have performed not only a fine service to the profession that you honor but you have performed, in my opinion, a very fine patriotic service in your willingness to come here and give this committee the benefit of your thought in these matters. It is for that reason that I feel that any words I can utter are very inadequate in expressing to you and those who have come with you our thanks and our appreciation for the help you have given to us today.

I do not want to preclude anybody else from saying anything they wish or asking any questions they wish, but I did want to have you know, speaking not only for myself but for the committee, how much we appreciate the help you have given this committee.

Dr. WRIGHT. May I reply by saying we have been very deeply appreciative of the fine spirit of friendship and kindness with which you have received what we have had to say. I have been in many hearings here, but I must say that our reception today is an all-time high in that regard. It has been very fine, and I am sure we are all very grateful indeed.

The CHAIRMAN. Any further comments or questions, gentlemen?

Mr. CARLYLE. Mr. Chairman, I would like to say that the hearing today has been very, very wholesome and helpful.

The CHAIRMAN. I am glad to hear it. I am sure that is true with all of us.

Is there anything further? Well, then, I suppose that concludes the hearing on heart disease for today. It may be that we will be calling for some additional service, especially from some committees that you may have at work who can give us answers to some questions which may arise in our minds as we go on with this study the next 2 or 3 weeks; and I am certain you will be glad to help us in that respect.

Dr. WRIGHT. I am sure that the American Heart Association and all of its facilities are at your service, sir.

The CHAIRMAN. Thank you. I hope we have not kept anybody from keeping his transportation assignment.

Dr. WRIGHT. I think not.

(Thereupon, at 4:10 p. m., Thursday, October 1, 1953, an adjournment was taken until 10 a. m., Friday, October 2, 1953.)

HEALTH INQUIRY

(Cancer)

FRIDAY, OCTOBER 2, 1953

HOUSE OF REPRESENTATIVES,
COMMITTEE ON INTERSTATE AND FOREIGN COMMERCE,
Washington, D. C.

The committee met pursuant to adjournment at 10 a. m. in the committee room of the House Committee on Interstate and Foreign Commerce, Hon. Charles A. Wolverton (the chairman), presiding.

The CHAIRMAN. The committee will come to order.

This hearing has been arranged for the purpose of reviewing and considering the progress that has been made in the investigation and control of cancer. This is one of the most serious diseases with which the human race is afflicted. I am told that it is the second leading cause of death from disease in the United States; second only to heart disease, which we discussed yesterday. This committee intends to find out what has been done about cancer in the past, where we stand on this problem today, and what can and should be done from now on in order to achieve effective control of this disease in the shortest possible time.

The members of this committee are not medical scientists, nor are they engaged in any other way professionally in cancer work. We have, therefore, called upon a number of eminent people in that field to tell us what is being done about cancer and to consult with us and advise us on this problem as one of common concern which affects all of us individually either directly or indirectly.

These people are scientists, public health administrators, physicians, and lay professional workers in both Government and voluntary agencies and organizations. This is their work, and they are best equipped to tell us about it. During the time available to us today the committee is looking forward to having an intensive discussion on all aspects of the cancer problem. We want to know what the magnitude of the problem is, how many people get cancer, what the financial drain is on the families of cancer victims, and what this means to the Nation in terms of lost production. We want to know what is being done to discover cancer cases early enough to treat them successfully, and what progress has been made in methods of treatment. We would like to know whether cancer can be prevented, and how. We want to hear the story of cancer research by both Government and nongovernment institutions, organizations, and individuals; and what the prospects are for learning more about this disease and developing better methods of dealing with it.

The various organizations invited to be represented here today have prepared written statements, copies of which are available to

the members of the committee, the press, and those in the audience who would like to have them. At this time I would like to have these statements officially entered in the record of the hearing.

(The statements referred to appear at appropriate points throughout the testimony.)

The CHAIRMAN. The committee has prepared a broad agenda covering cancer, as a guide to our discussion. Copies of this agenda are available to the participants in the hearing, and they have indicated their willingness to discuss the various subjects covered by it. At this time I wish to have the agenda and the list of witnesses entered in the record.

(The information is as follows:)

AGENDA FOR THE HEARING ON CANCER—HOUSE COMMITTEE ON INTERSTATE AND FOREIGN AFFAIRS

I. Introductory remarks by the committee chairman.

II. Why cancer is a major public health problem in this country.

A. What it is, the nature of this family of diseases.

B. Who gets cancer? How many people are under treatment for it now? How many new cases this year? How many people will die of cancer in 1953? The rise of the cancer death toll during recent years? The outlook for 1965 or 1975?

C. What are the most frequent types of cancer in men, women, and children?

D. What is the cost of cancer illness to the Nation in loss of productive manpower, to communities in financial aid to families and provision of hospital care to families?

III. What is available today in the way of treatment, diagnosis, and prevention?

A. What are the accepted methods of treatment? Are many cancers cured by them? Are there any wonder drugs that can be used against cancer? Or any products of atomic-energy research? Where do we stand with regard to X-ray, radium, surgery, drugs, synthetic hormones? In availability of cancer clinics?

B. What can doctors do now to detect cancer early? How good are present methods? Is there a reliable blood test for cancer? Where do we stand in—

The detection of cancer by physical examinations, X-ray, specific tests, radioactive isotopes.

The development of blood or chemical diagnostic tests.

The use of detection centers.

Educating the public and the doctors, dentists, and nurses to the importance of early diagnosis and prompt treatment of cancer.

C. What can be done now to prevent cancers? In industries where workmen may be exposed to cancer-causing hazards? By adequate handling of precancerous lesions?

IV. What resources of skilled personnel, facilities, and funds are being devoted to the nationwide attack on cancer? What are the cooperative relationships among the various groups working in the cancer field? How are the different activities coordinated?

A. By private and voluntary organizations at the community, State, and national levels (American Cancer Society, Damon Runyon Fund, American College of Surgeons, American Medical Association, medical schools, hospitals).

B. By governmental agencies at the community, State, and national levels (State health departments, the National Cancer Institute, Atomic Energy Commission, Veterans' Administration, Department of Defense).

V. As a whole, what are the interested groups and agencies doing to improve treatment, diagnosis, and prevention of cancer?

A. In fundamental research on the cause and development of cancer? On the role of heredity, viruses, diet, various factors in the human environment?

B. In clinical and basic studies to improve the treatment of cancer by the different kinds of radiation, by surgery, and by anticancer drugs and hormones?

C. In learning more about preventing cancers through studies of materials used in certain industrial processes, experimental production of cancer in animals, and of the relationships between human cancers and factors such as race, marital customs, age, and sex?

D. Through provision of skilled scientists needed to carry on research and physicians with special training to treat cancer patients?

E. To provide hospitals, clinics, or centers properly equipped to treat cancer patients and to do the necessary diagnostic procedures?

VI. What are the recommendations for strengthening the attack on cancer?

A. In research, both laboratory and clinical?

B. In maintaining an adequate supply of scientists and physicians?

C. In education of physicians and members of allied professions? In public education?

D. In State and community programs?

E. In improved medical practice and medical facilities?

PARTICIPANTS

Dr. John R. Heller, Director, National Cancer Institute, Bethesda, Md.
Dr. Charles Cameron, medical and scientific director, American Cancer Society, New York, N. Y.
Dr. Cornelius P. Rhoads, scientific director, Memorial Center for Cancer and Allied Diseases, New York, N. Y.
Mefford R. Runyon, executive vice president of the American Cancer Society, New York, N. Y.
Dr. Paul L. Wermer, secretary, committee on research, American Medical Association, Chicago, Ill.
Dr. Sidney Farber, scientific director, Children's Cancer Research Foundation, Boston, Mass.
Dr. R. Keith Cannan, Chairman, Division of Medical Sciences, National Research Council, Washington, D. C.
Dr. G. Burroughs Mider, Associate Director in Charge of Research at the National Cancer Institute, Bethesda, Md.
Dr. Ralph G. Meader, Chief, Research Grants Branch, National Cancer Institute, Bethesda, Md.
Dr. Ira T. Nathanson, Chairman, Committee on Cancer Diagnosis and Therapy, National Research Council, Boston, Mass.
Mr. John Teeter, Damon Runyon Foundation, New York, N. Y.
Dr. Antonio Rottino, director of laboratories, St. Vincent's Hospital, New York, N. Y.

The CHAIRMAN. Because much of what we will hear today will be of a technical nature, the discussion can better be led by one of our experts than by the committee. I understand that Dr. John R. Heller, Director of the National Cancer Institute of the United States Public Health Service, will act as discussion leader for this hearing. Dr. Heller, I wish that you would kindly proceed to outline for us in more detail the plan of our discussions, and introduce those who are going to participate. I hope that you will feel free to direct the course of these discussions in such a way as to bring out the maximum amount of information within the limited time at our disposal. Members of the committee will, of course, have questions to ask from time to time.

Dr. Heller, we would like you to take over at this time; and I would like those who are here to participate with you in this discussion this morning to realize that the committee greatly appreciates your presence, the thought and the attention that you have given to this matter, and your willingness to be present to assist the committee in what it considers this very important work that it is seeking to do with respect to the diseases that are common to our people and leading particularly and finally to how it will be possible through congressional action or otherwise to be helpful in the general progress of the work that is being done to relieve our people from this great disease.

We thank you for your presence. We know it has been a great inconvenience to your folks to come. All of you are busy individuals. For that reason we appreciate all the more the fact that you are here and willing to give of your knowledge, study, and experience to this committee in this important matter.

Dr. Heller.

STATEMENT OF DR. JOHN R. HELLER, DIRECTOR, NATIONAL CANCER INSTITUTE, BETHESDA, MD.

Dr. HELLER. Mr. Chairman and members of the committee, participants and gentlemen, this group represents the people who are charged with the responsibility for administration and execution of programs of cancer control and cancer research.

I should like to introduce the members of the panel and I should like each to rise, state his name, his official position, his activity with the organization with which he is connected, and any other pertinent data which the committee might find helpful.

I should like to start on my left with Dr. Rottino.

The CHAIRMAN. Will you give the name in full, please.

Dr. ROTTINO. Antonio Rottino. I am the director of laboratories and pathologist for the St. Vincent's Hospital in New York City. I am also director of Hodgkin's research at that institution. I come as one of the representatives for the Damon Runyon Foundation, being a member of the advisory committee.

Dr. HELLER. Dr. Charles S. Cameron.

Dr. CAMERON. I am medical and scientific director of the American Cancer Society and am clinical assistant surgeon at the Memorial Hospital and the James Ewing Hospital in New York City.

Dr. HELLER. Dr. Keith Cannan.

Dr. CANNAN. I am Chairman of the Division of Medical Sciences of the National Research Council. As such, the National Research Councils holds a general watching brief on research in general, and the Division of Medical Sciences on research in the medical field. We represent the major scientific societies of the country. We have a particular interest in cancer because we are adviser to the American Cancer Society on its program of research.

Dr. HELLER. Dr. G. B. Mider.

Dr. MIDER. I am Associate Director in Charge of Research at the National Cancer Institute. With the key members of the staff I am responsible for the program of intramural research within the organization.

Dr. HELLER. Dr. Cornelius P. Rhoads.

Dr. RHOADS. I am the scientific director of the Memorial Center for the Treatment of Cancer and Allied Diseases in New York City; director of the Sloan Kettering Institute for Cancer Research, the research division of that hospital; and professor of pathology at Cornell University College of Medicine.

Dr. HELLER. Mr. Mefford Runyon.

Mr. RUNYON. I am the executive vice president of the American Cancer Society; the only layman, I believe, who so far has been introduced.

Dr. HELLER. Dr. Sidney Farber.

Dr. FARBER. I am scientific director of the Children's Cancer Research Foundation in Boston, responsible there for the care of children with cancer and for a research program designed to find new methods of treatment for children with cancer. I am also professor of pathologoy at Harvard Medical School, stationed at the Children's Hospital; and am a member of the National Advisory Cancer Council.

Dr. HELLER. Dr. Ralph Meader.

Mr. MEADER. I am Chief of the Cancer Research Grants Branch of the National Cancer Institute; and as such under the general guidance of Dr. Heller carry out the administration of the research grants funds appropriated by the Congress. In this effort the National Cancer Institute, Public Health Service, is advised by the National Advisory Cancer Council, a group of appointed officials, nongovernmental employees, of which Dr. Farber is a member.

Dr. HELLER. Dr. Paul Wermer.

Dr. WERMER. I am Paul L. Wermer, of Chicago. I am secretary of the committee on research of the council on pharmacy and chemistry of the American Medical Association. I am here as a representative of that association to outline our activities in the clinical research and education in cancer.

Dr. HELLER. Dr. Ira Nathanson.

Dr. NATHANSON. My name is Dr. Ira T. Nathanson. I am associate clinical professor of surgery at Harvard Medical School; the director of the Massachusetts division of the American Cancer Society; I am a member of the staff of Huntington Laboratories; which are the laboratories of the Harvard cancer committee; and I am chairman of the National Research Council's Committee on Cancer Diagnosis and Therapy.

Dr. HELLER. Dr. Gordon Granger.

Dr. GRANGER. Dr. G. A. Granger, Acting Medical Director of the Food and Drug Administration. We are involved in enforcing the Food, Drug, and Cosmetic Act.

Dr. HELLER. Have I overlooked any witnesses in the audience not known to me?

I believe, Mr. Chairman, that constitutes the group of witnesses.

The CHAIRMAN. Now that you have introduced your associates, will you introduce yourself and give your background.

Dr. HELLER. I am Dr. John R. Heller, Director of the National Cancer Institute, a Federal activity charged by the Congress with the responsibility for the study of the causes, diagnosis, treatment, and prevention of cancer; a very broad charge which the Congress established in 1937 and implemented with the appropriate funds. And since that time there has been a very marked expansion of activity in the Federal program. This has received the support of the people, as evidenced by the interest of the Congress.

The CHAIRMAN. With reference to your mentioning the fact that this was a Federal agency, it is always gratifying to members of this committee to realize that it was this committee which established the several national institutes that have performed so well; and our only regret is that probably there has not always been sufficient appropriations to have accomplished all you would have liked to have done. We are hopeful, however, that by hearings such as these and acquainting the general public with the situation that exists, both with

respect to the number of people incapacitated by these diseases and also by the work that can be done in the way of research, there will be a more general support given to the efforts to make all of these institutes more effectual in carrying out the will of Congress by providing appropriations that will enable them to do so.

Now you may proceed, Dr. Heller.

Dr. HELLER. Thank you, Mr. Chairman. Members of the panel, the chairman desires that we discuss the several broad aspects relating to causes, diagnosis, treatment, and prevention of cancer, with especial emphasis toward the magnitude of the problem, the economic impact upon our socity, the accomplishments of research, the accomplishments of the translation of research into those elements which lead to control of the disease in the population, and the most important element of research—to find and establish and develop those elements which can lead ultimately to the control of cancer.

I should like to establish in as broad terms as I can, Mr. Chairman, some of the facets which we see as residing in the framework of this very complex question of cancer control; cancer control being used in the broad sense, embracing research in all of its facets.

To begin with, cancer is not only an extraordinarily complex disease but it is one in which the cause is not established. There being no known definitive cause of cancer in the medical sense, the diagnosis of the disease has been hampered by this very fact of being unable to establish a cause or causes.

I should like to establish, also, the fact that cancer is not considered usually as one disease. It is considered as many diseases. It is likely, therefore, that there may be various causes involved rather than one cause.

By the same token, there will probably be a number of treatments instead of one treatment for cancer.

We are confronted, then, with a situation in which research, while aimed at the general problem of cancer, nevertheless has to consider these several complicating variables.

Cancer, as most of you know, is a disease which has grown not only in importance—it has always been important to our society—but has grown because we are an aging population in the sense that each year more of us are entering the older age brackets, since medical science has been successful in eliminating those communicable diseases especially which previously were major causes of death. We find that since 1900, cancer has come from eighth place in cause of death to second place at this time. While it is primarily a disease of the older age groups it must be remembered that better than 15 percent of the deaths from cancer occur in individuals under the age of 45.

It is estimated that this year, 1953, there will be about 224,000 deaths from cancer. There are coming to medical attention each year about 530,000 cases of cancer. It is estimated that at the rate at which we are acquiring cancer 50 million of the present population of the United States probably will acquire cancer and about 25 million of them will die from that disease.

I would not like to leave in the minds of the committee a grim or gruesome picture because of the statistics which I have related. There is cause for optimism. This optimism will be developed by the several members of the panel. I think that the evidence which you will hear will indicate to you that advances have been made and

that such advances are susceptible of great improvement in the next few years; and certainly the dedication of the men of medicine in the research and the control fields of cancer is such that we can look forward confidently to what we, from the public-health viewpoint, call control of the disease, which is aimed ultimately at eradication. Falling short of eradication, the alleviation of pain, and the prolongation of the useful years of life which an individual can enjoy and live out for the most part his normal span, are at least secondary goals. But we are not content with that; we are aiming at the ultimate elimination of the disease.

We will speak of cancer as a disease because it is usually considered that, but I should like to reemphasize my point that cancer probably is many diseases, and some of the research which will be related I think will bear that out.

I should like to comment very briefly upon the economic impact of cancer on our society.

It is quite apparent that loss of productiveness particularly on the part of a breadwinner is a very disrupting and a very important element in our social economy.

It is estimated that about $12 billion each year is lost as a result of this loss of productivity.

Not included in that, however, is an element which to me is of almost equal importance, and that is the tremendous drain upon the finances of the family as a result particularly of the loss of the breadwinner and the consequent expense both of treatment and hospitalization, besides the crippling of this individual in the event of arrest or cure of the disease. That will be substantiated as this hearing progresses and I shall leave to other members of the panel the development of the advances in therapy and diagnosis; I shall leave also the elements of research in its broadest sense, and we shall attempt to relate research to the interest of this committee in the situation of the outlined accomplishments which we hope will be apparent to you and which have been inherent in the proposition that there is reason for optimism.

Similarly, the various members of the group testifying will also establish, I am sure, and it will become apparent to you, the difficulties confronting the worker in cancer.

I should like to leave with you the proposition that it is not a simple matter; cancer research is not simple and cancer control is not simple. We must overcome the lag between what we know and what we do, and we look to cancer research to furnish us surgical means and better tools with which to do this job.

I should like to indicate that we will embrace this agenda which the chairman has requested that we consider; we will not follow this agenda in a strict, rigid form, Mr. Chairman, but it will be encompassed in the discussion.

I should like to develop several important points which I believe will be pertinent to the committee and I should like to ask Dr. Charles Cameron, medical and scientific director of the American Cancer Society, to indicate and amplify the magnitude and scope of this cancer problem.

Dr. Cameron.

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STATEMENT OF DR. CHARLES CAMERON, MEDICAL AND SCIENTIFIC DIRECTOR, AMERICAN CANCER SOCIETY

Dr. CAMERON. Mr. Chairman and committee members, may I enter a prepared statement for the record?

The CHAIRMAN. Without objection, so ordered.

(The prepared statement referred to is as follows:)

CANCER IN THE UNITED STATES

A statement of the extent of the problem, the nature of the program to combat it, and accomplishments of the control effort, prepared by the American Cancer Society, Inc.

CANCER'S INCREASE

Fifty years ago the annual death rate from cancer in the United States was 64 per hundred thousand of population. The estimated death rate for the current year is in the order of 145 per hundred thousand. Much of cancer's increase is attributable to the unprecedented lengthening of the span of life brought about in two generations by sanitation, by immunization, by antibiotics, and by more extensive yet safer surgery (chart 1).

The life expectancy for men is today close to 60 years and that for women has already passed the scriptural 3 score years and 10. The aggregate result is that there are today more than 3 times as many persons in the United States over the age of 45 as there were at the turn of the century (chart 2). Since cancer is predominantly a disease of persons beyond the age of 45 (chart 3), it would perhaps not be unexpected that there should be 3 times as many cancer deaths recorded today as there were 50 years ago. However, this explanation does little to dispel the alarm with which one views the anticipated increase over the next 50 years if present rates of increase continue unchanged (chart 4). Whereas for the present year the number of deaths attributable to cancer is estimated at 220,000, by the year 2000 the annual number of cancer deaths is expected to reach 415,000. However, the fact should be noted here that a substantial number of present cancer deaths are avoidable and that this anticipated increase can be significantly reduced.

The late increase in cancer's recorded incidence and mortality is, to an indeterminate degree, due also to more accurate diagnosis now available generally. Improved standards of medical care, by reducing deaths from infectious and parasitic diseases, and by diagnosing cancer with greater precision, serve to increase the reported amount of cancer in a population. Thus, while the mortality from infectious and contagious diseases varies inversely with the number of doctors per unit of population (chart 5), the paradoxical fact is that the more doctors there are, the higher the cancer death rate appears to be (chart 6). This could lead the unwary—and it sometimes does—to conclude that if one has cancer a doctor is the last person he should see; what it actually means is that, in areas with adequate or high-standard medical services, more people escape early death and fewer patients with cancer die unattended, undiagnosed, and untreated. This fact is further borne out by comparing the nations of the world having death rates of less than 1,500 per 100,000 of population with those having death rates in excess of that figure, whereby it is noted that the countries having high general death rates tend to have low cancer rates, whereas countries having low general death rates tend to have high cancer rates (chart 7). High living standards, high literacy rates, good nutrition, high-quality and generally available medical care reduce deaths from infectious, parasitic (epidemic), and nutritional diseases, leaving little left to die from except cancer and heart disease.

While these two factors—lengthening life and wider recognition of cancer—account for the bulk of cancer's mounting incidence and mortality, they do not appear to do so for every kind of cancer. Indeed, at least one form of cancer, namely, cancer of the lung, is increasing at an alarming rate and one which suggests the operation of cancer-producing factors of relatively recent development.

THEN AND NOW

At the turn of the century, cancer in the United States was eighth in the list of causes of death preceded by heart disease, tuberculosis, pneumonia, Bright's disease, diarrhea and enteritis, and diseases of the vascular system. Seventy-eight thousand people a year were dying from it. What research there was was more of alchemy than science. There was but one specially designated cancer hospital and there were no cancer clinics. There was no support from the Federal Government of programs of research or control, and only one State recognized its responsibility in this respect. No word of cancer appeared in the media of public information. Nowhere was cancer a reportable disease. The biopsy was still a subject of controversy among doctors. X-rays were being employed somewhat gingerly and radium cost five times its present price, thereby limiting its availability greatly. The operation for cancer of the rectum was an innovation, and tumors of the central nervous system, of the lung, of the pancreas, and of the esophagus were not yet surgical diseases. Anesthesia was limited to 2 or 3 agents of limited flexibility. Medical education was unstandardized and diplomas from "mills" afforded their purchasers the same rights and privileges as were open to the graduates of first-class schools.

Today, cancer is second among the causes of death, now striking 1 in every 5 of our population and being the cause of 1 in every 7 deaths. The countrywide budget for cancer research in the United States is in the order of $15 million annually. The American College of Surgeons approves 11 cancer hospitals, 539 cancer clinics, and 113 cancer diagnostic clinics. There are about 240 cancer-detection centers, the primary objective of which is to uncover unsuspected cancer in presumably well persons. This year's appropriation by the Federal Government for cancer research and cancer control is $20,237,000, and the voluntary health agency, the American Cancer Society, has this year received $19,500,000 in contributions from the public. Cancer information is given wide attention in newspapers, magazines, on the radio, and television. X-rays are being generated at higher and higher voltages and targeted with increasing precision, while radium or its new substitute, radioactive cobalt, are available widely throughout the country. Surgery has boldly extended its frontiers so that there is virtually no part of the body now sacred before the scalpel. Virtually everything we know today about cancer has been learned in a single generation, yet we are still in the green years of medical progress and there is no evidence to justify resignation nor apathy in respect of future progress in the control of this disease.

CURABILITY

Yet, while it is true that the curability of most forms of cancer is being slowly increased, the stark fact remains that successful treatment is still delimited by the extent of disease. Which is to say that, by and large, cancer is curable only when it is reasonably localized or confined to the organ in which it originates. However, the cardinal feature of this disease is to spread, sooner or later, from its site of origin to distant parts of the body—a phenomenon known as metastasis. Once such dissemination has occurred, even today's heroic surgery and high energy radiations are usually ineffective. To an important degree, whether cancer is localized or disseminated is a function of time—although equally important, and sometimes more so, the inherent biological behavior, or growth activity, of a tumor is also determining. Tumors vary greatly in their speed of growth and in their tendency to spread, characteristics not susceptible of influence today. Time is the only factor determining the outcome about which anything can be done, assuming, of course, the availability of adequate treatment. With the importance of time or delay in influencing the result in mind, consider the fact that cancer of the cervix, the most frequent cause of death from cancer among women, is curable in 70 to 80 percent of patients treated while it is confined to the neck of the womb, whereas not more than 20 percent of all patients with this disease are actually being cured; that cancer confined to the breast can be cured 8 times out of 10, whereas the overall cure rate of breast cancer is less than 35 percent; that small cancers of the mouth can be cured 65 percent of the time, whereas fewer than one-third of all oral cancers are actually being cured; that 80 percent of cancer of the larynx is curable when treated while the disease is confined to 1 vocal cord, although cures being accomplished do not amount to more than 15 percent of all patients (chart 8). This striking dichotomy between cures achievable under optimal conditions of localized disease and expert treatment

and the cures actually being accomplished is one of the unique features of cancer and one which forms the basis of the program for its control.

While, as has been said, "early diagnosis" is not synonymous with "curable," the principle, "the earlier, the better," remains a cardinal precept in medical practice and in cancer control.

In aggregate, it is probable that about one-fourth of patients with cancer today, receiving proper medical care, are being cured. With the methods of treatment presently at hand, it is estimated that twice this number could be cured, provided the aforementioned optimal conditions could be achieved. In terms of actual numbers, this means that approximately 73,000 lives are being saved yearly and that an equal number now dying are potentially salvageable. The remaining doomed half of those destined to develop cancer must look to the advances of future research for their salvation (chart 9).

PUBLIC EDUCATION

Recognizing the critical importance of time, or delay, in influencing the results of cancer treatment, a group of doctors in 1913 recommended the establishment of a voluntary organization whose objective it would be, among other things, to develop and carry on a broad program of public education. Specifically, the program would seek to inform the laity of the early warning signs of cancer and to make clear the importance of immediately heeding them. Today this program of public education continues and its basis is the Seven Danger Signals of Cancer (chart 10). Every medium of communication and public information is utilized in promulgating this information: Printed pamphlets, motion pictures, radio, television, exhibits, window displays, billboard posters, car and bus cards, bulletin-board handbills, special mailings, and talks by properly qualified persons to groups and assemblies of many kinds, such as women's clubs, parent-teacher associations, church guilds, industrial groups, and mass public meetings.

Recent studies offer evidence that this 40-year-old effort in health education of the public has borne fruit. Virtually every study of the trend of the factor of delay for which the patient is responsible has shown a consistent lowering in the element of delay. To put it another way, more patients are being seen with earlier cancer than ever before (charts 11, 12, and 13). These findings are substantiated by the experience of most practicing physicians who have commented on this facet of the problem.

PROFESSIONAL EDUCATION

The increasing consciousness of cancer on the part of the public has imposed added burdens on the medical profession, for it is a fact that the earlier the cancer, the more difficult it is of diagnosis. Therefore, in order to assist doctors to maintain a high index of suspicion paralleling that of the public, the American Cancer Society conducts its national office and affiliated divisions an intensive program of profession education (chart 14).

Through publications, library reference services, the monthly index of current cancer literature, through motion-picture films produced in cooperation with the National Cancer Institute, through refresher courses, and now through the medium of closed circuit color television, the society endeavors to bring to the practicing physician, already overburdened by an avalanche of new medical information, the facts about cancer which will facilitate his handling of the clinical problems which it presents in office practice.

Eighty-eight clinical fellowships awarded annually permit young physicians to obtain additional training in the diagnosis and treatment of cancer in its special forms; and 15 fellowships in exfoliative cytology or smear diagnosis permit qualified pathologists to spend varying periods up to a year in acquiring proficiency in this new and extremely useful diagnostic technique. In addition, fellowships are available to permit young physicians who have already obtained in the United States extensive training in radiation therapy to go abroad to study for a period of 1 year at selected radiation therapy centers in the Scandinavian countries, the United Kingdom, and France. Every 3 years, the American Cancer Society joins with the National Cancer Institute and the American Association for Cancer Research in conducting a National Cancer Conference, in which clinical and research aspects of cancer are reviewed and progress evaluated.

DETECTION OR CASE FINDING

But useful as the danger signals have been and will continue to be, experience demonstrated (1) that all too often the apperance of a danger signal was, in fact, a manifestation of moderately advanced disease, and (2) that it was frequently possible to discover cancer—"silent" cancer—in patients who had no signs nor symptoms of disease. This was, in effect, discovering cancer before it had given rise to gross expressions of its presence. The effort to find cancer in nonsymptomatic patients was begun on a formal scale in 1937 and initially it was confined to the search for cancer of the uterus. When it had been shown that truly early and curable cancers could be found in patients in advance of symptoms, the practice was taken up by others and extended to other body sites. There are today some 240 cancer detection centers in the United States (chart 15), which operate for the most part in the environment of a hospital clinic and which endeavor to confine their activity to the search for cancer and other diseases in presumably well persons. More recently, medical societies in a number of States have endeavored to have this practice of cancer detection adopted as a formal regime oriented to office practice and it can safely be said that these routine physical checkups, so important in the maintenance of health, particularly in older persons, are more widely sought than ever before. Nevertheless, only a small fraction of the population submits to such regular examination.

In an analysis of the effectiveness of this type of preventive medicine—preventive in the sense of preventing deaths—the American Cancer Society studied the cancer yield in some 52,000 examinations conducted in 90 detection centers. It was found that the rate of cancer for the entire group of examinees unselected as to age was eight per thousand. The rate of cancer discovered varied from 1.2 cases per thousand for the group under 30 years of age, to 34.3 per thousand in the group aged 60 and beyond, with, as was to be expected, a progressive rise in the cancer yield with advancing years. These facts suggest that, while it may be impractical and, indeed, impossible, to examine the entire population for evidence of cancer or other disease on a regular schedule, nevertheless an approach to effective chronic disease prophylaxis might be achieved through the establishment of such screening devices as selection according to age. Thus, it seems poor economy to attempt to find cancer under the age of 40. It appears distinctly worthwhile to do so in persons beyond the age of 50 (chart 16).

SERVICES OF THE AMERICAN CANCER SOCIETY

Approximately two-thirds of the cancer detection centers referred to above have been supported in some measure by field units of the American Cancer Society. Other services subsidized or provided by the society in an effort to improve the quality of cancer service in the United States include financial assistance to cancer clinics and cancer diagnostic clinics, previously referred to (chart 17). The society also maintains information services in most of the major cities and in many of the smaller communities. The society supports local visiting nurse associations in order to increase the quantity and quality of nursing care to patients confined to the home; in addition it is the society's policy to provide, where needed, practical nursing service and housekeeping assistance. Many units of the society, further, provide drugs to indigent patients for whom the purchase of vitamins, hormones, and narcotics is burdensome, if not impossible. The society's volunteer arm provides transportation for patients going to and from the hospital or doctor's office, unlimited dressings for those needing them, maintains loan closets where some 240 items of sickroom necessity or convenience are stocked and available without cost, recreational therapy programs for patients confined to home or hospital and a home visiting service (chart 18).

STATISTICAL RESEARCH

Evidence at hand indicates that, whereas there does not appear to be any significant difference in susceptibility to cancer in general in different parts of the world, there is noted a predeliction for certain kinds of cancer in certain areas or among certain ethnic groups. Study of the geographic distribution of cancer according to its type and site is now recognized as a respectable enterprise and the American Cancer Society and the National Cancer Institute are engaged in various studies in an effort to elucidate the pattern of incidence of cancer and

to derive therefrom, if possible, helpful, even important, suggestions as to cancer's causes.

Such epidemiologic studies form an important segment of the statistical research section of the national office of the American Cancer Society. For example, collation of information from various sources discloses the fact that cancer of the skin is significantly more common in the South and South Central States of the United States than it is in the Northwest or Northeast (chart 19). It has long been suspected that solar radiation can, in proper amounts and over sufficiently long periods of time, favor the development of skin cancer, a surmise now supportable by laboratory experiment. It appears obvious that the increased prevalence of cancer of the skin in the regions cited, is attributable to the increased occupational and recreational exposure of the inhabitants to strong rays of the sun. Of course, not all people so exposed do actually develop cancer of the skin, so that one must conclude that there is a factor of individual susceptibility operating also. Other curious differences in the attack rates of cancer, site by site, are apparent within the United States. Thus, cancer of the uterus appears with as great frequency in the South as it does in the Northeast, whereas cancer of the breast appears to be distinctly less common in the Southern belt (charts 20 and 21). These curious differences have invited much speculation and it is probable that among the reasons already advanced for certain of these differences some will prove to be substantiable. Among the other activities of the statistical research section (chart 22) of the society is a study, now going forward, of the possible relationship between smoking practices and the incidence of cancer of the lung. The section has, in cooperation with the National Institutes of Health of the United States Public Health Service, devised a standard method for cancer-reporting on a statewide basis, and this system, or modifications of it, are gradually being adopted.

TRENDS: AN EVALUATION OF EFFECTIVENESS

Scattered and early returns from a number of sources support the validity of the program of cancer control described. If there is any virtue in reducing the delay before treatment, in improving facilities for diagnosis and treatment, in increasing professional educational opportunity, in stimulating case finding—it should be apparent in improved or lengthened survivorship.

In 1937 a study, based on all cancer patients admitted to hospitals in Vermont, yielded the fact that only 20 percent of the group had localized disease and were considered candidates for curative treatment. A study in the same State 10 years later indicated that the percentage of cancer patients admitted to Vermont rospitals with localized disease had risen to 58 (chart 23).

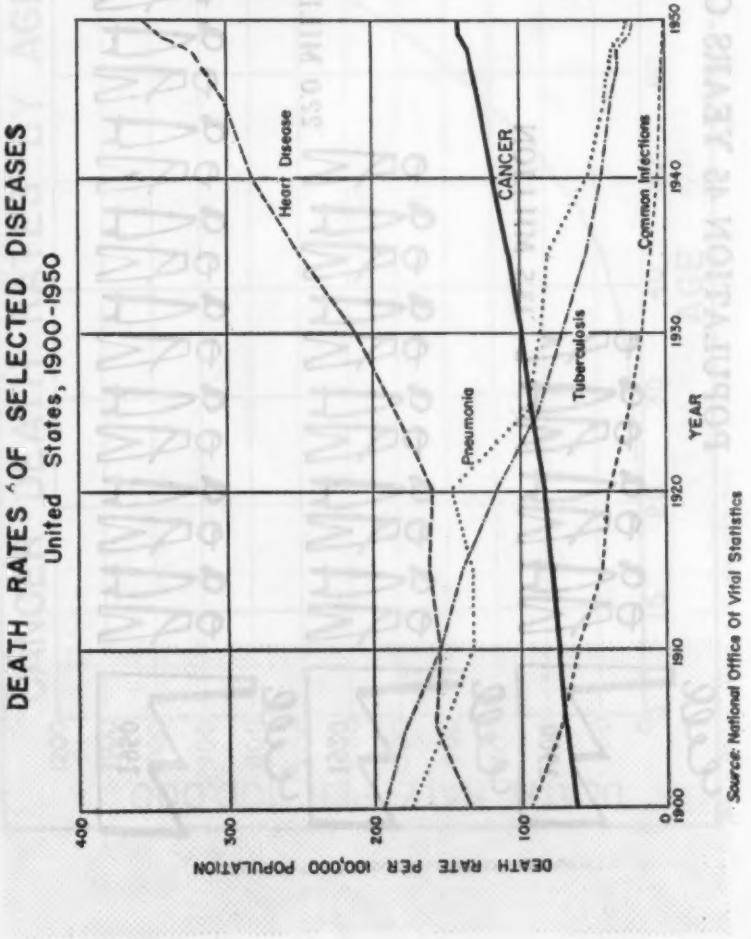
Among breast cancer patients seen in the Mayo Clinic between the years 1910 and 1919, 63.6 percent were found to have involvement of axillary lymph nodes; that is, cancer had spread from the organ of origin to the neighboring lymph glands—a relatively unfavorable setting for cure. Of the breast cancer patients seen in the same clinic in the year 1945, the proportion with axillary nodal involvement had dropped to 45 percent (chart 24). These figures are reflected in the steadily increasing cure rates reported from that clinic: of all patients with breast cancer operated on in the period 1910 to 1914, 39.7 percent were living 5 years later; of the patients operated on during the period 1940 to 1944, 62.4 percent were living 5 years later. This experience is confirmed by that in the Memorial Hospital, New York (chart 25).

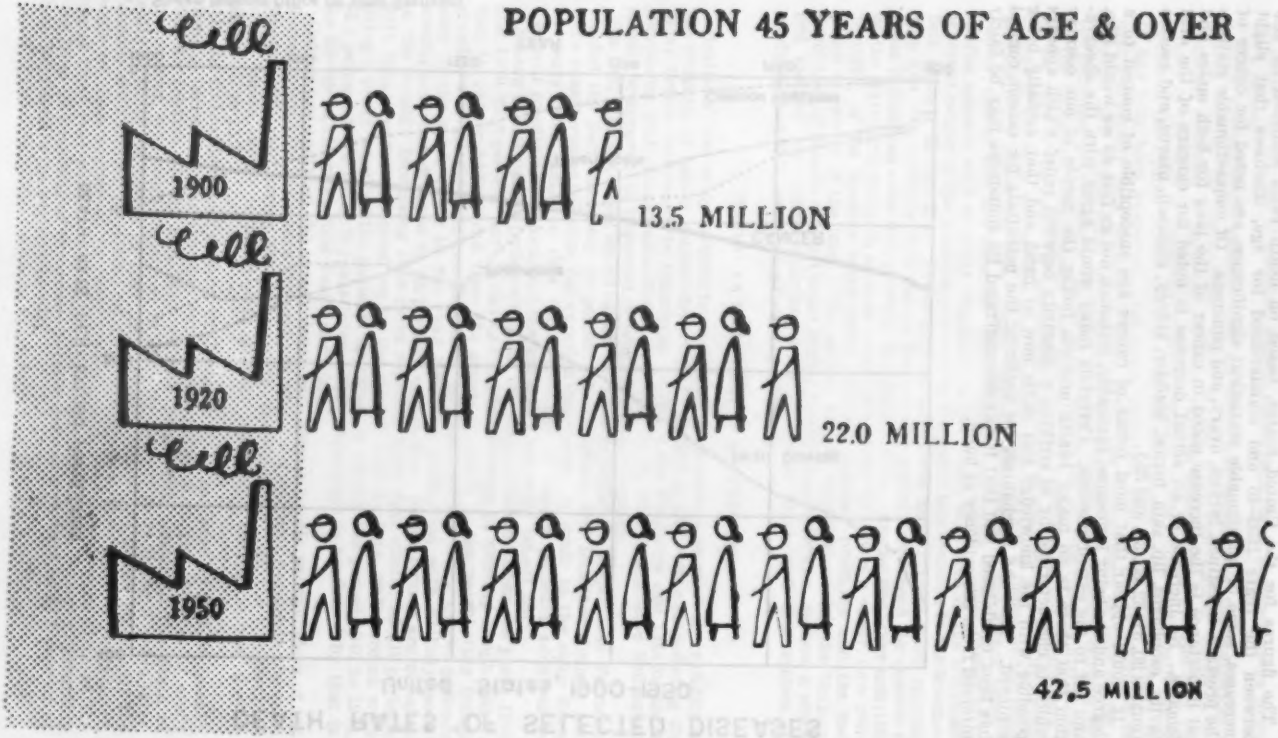
Dublin has analyzed the cancer death rate among female policyholders of the Metropolitan Life Insurance Co. and has found a 11-percent decline in the total cancer death rate during the decade 1938–48 (chart 26). In the age group 55 to 64, where cancer is noted with greater frequency, the percentage decline amounted to 15.1.

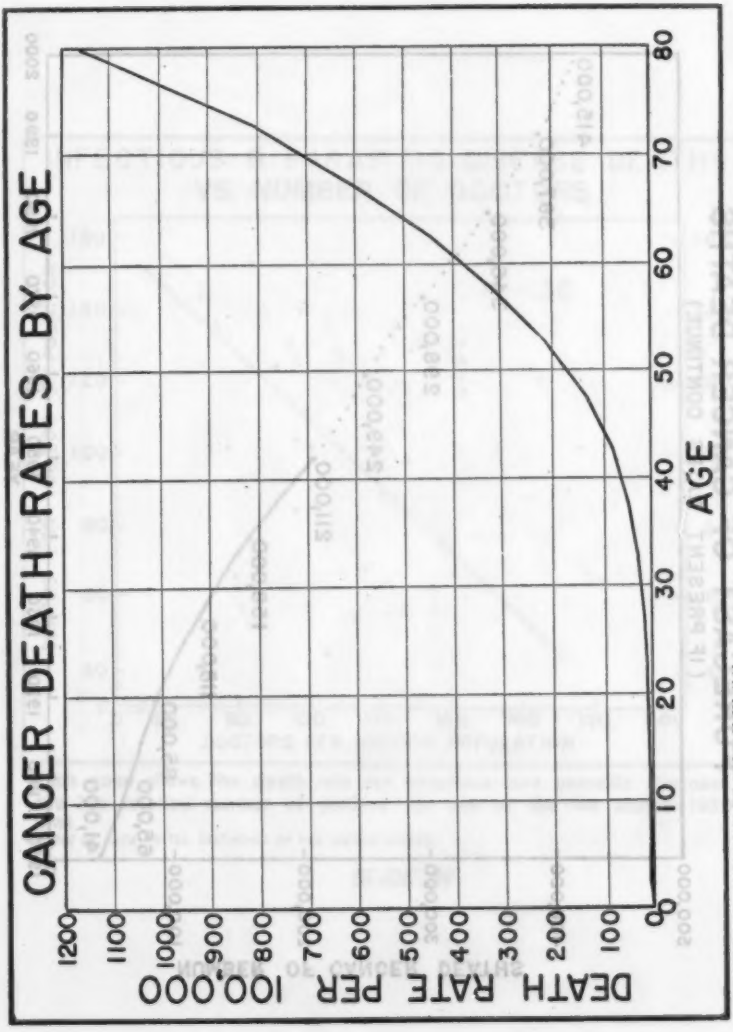
In the statewide cancer registry of Connecticut, as analyzed by E. J. McDonald, steadily increasing survivorship rates were recorded in the interval of study 1935–41 (charts 27, 28, and 29). Of the males with cancer in the State of Connecticut, who were registered in 1935, 18 percent were living 5 years later, while of those registered in 1941, 25.7 percent passed the 5-year mark. Of the females with cancer registered in 1935, one-quarter were alive 5 years later, while of those registered in 1941, approximately 40 percent were alive at the end of the 5-year period. For males and females combined, 5-year survivorship rose from 22.1 percent of the group initially recorded in 1935 to 33.5 percent of those admitted to the registry in 1941.

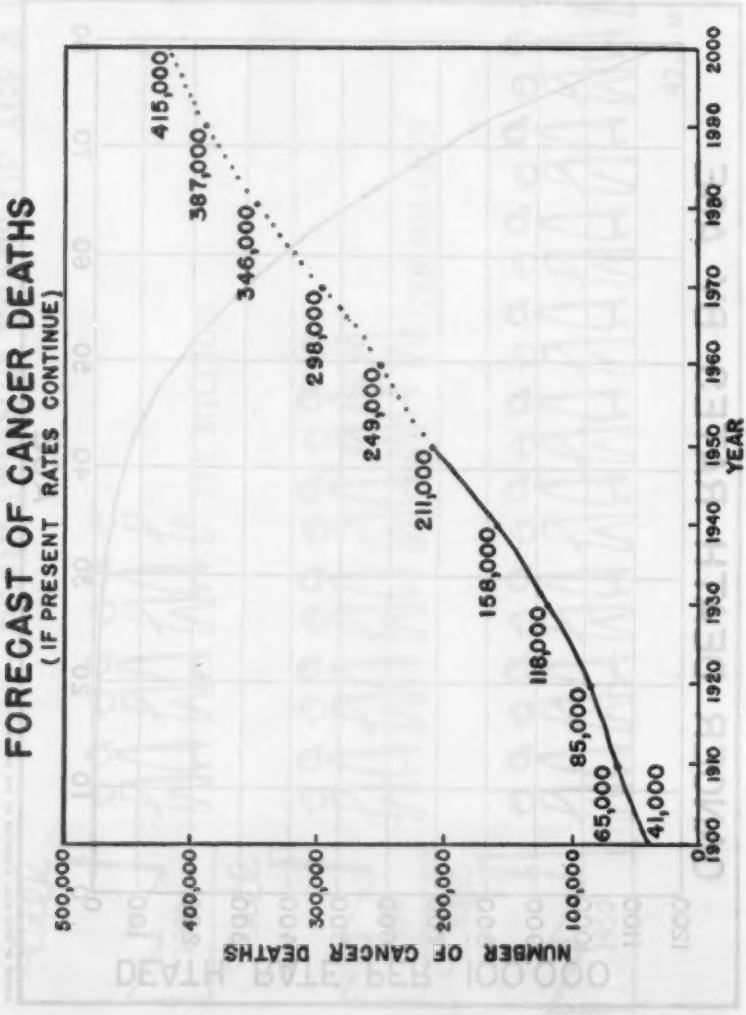
The figures for the United States, based on death rates analyzed by site between the years 1933–46 and standardized for age, discloses that slight increases, some of questionable statistical significance, are noted for cancer of the prostate, intestines, larynx, ovary, and pancreas. Of unquestionable statistical importance is the increase noted in cancer of the lung for both males and females. No increase or an actual decrease is noted for cancers of the oral cavity, esophagus, lip, skin, breast, bladder, kidney, stomach, uterus, and rectum (charts 30, 31, 32, 33, 34, and 35).

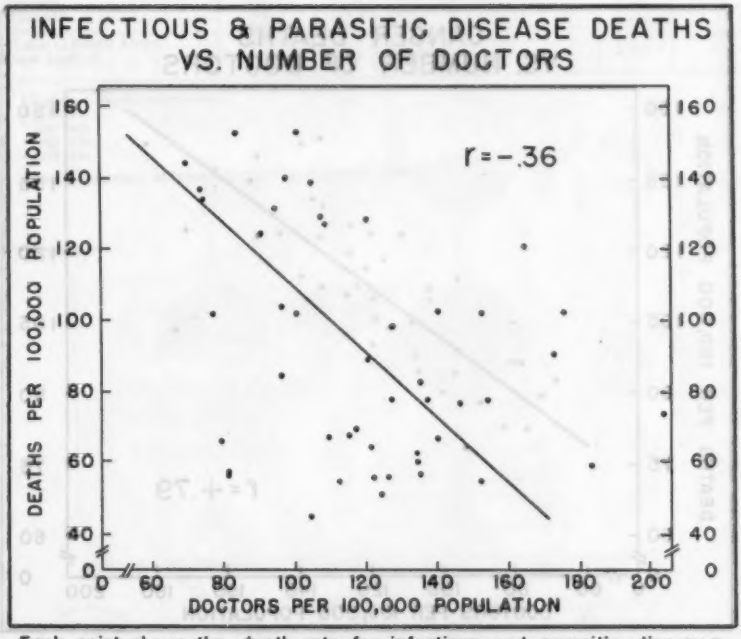
It would appear that most forms of cancer are susceptible of control to a degree and are being influenced favorably, although not as fast as we would like, and not to the extent possible. Certainly many would agree with the observation that there is no major health problem facing the people of our country which is characterized by so striking a disparity between relief which appears possible with the knowledge and skills now at hand and that actually being achieved. That the mechanism for realizing the potentials for cancer control has been established and that it has demonstrated its soundness may be fairly inferred from the evidence at hand.




POPULATION 45 YEARS OF AGE & OVER
1900
13.5 MILLION
1920
22.0 MILLION
1950
42.5 MILLION


CANCER DEATH RATES BY AGE
DEATH RATE PER 100,000
1200
1100
1000
900
800
700
600
500
400
300
200
100
0
0
10
20
30
40
50
60
70
80
AGE

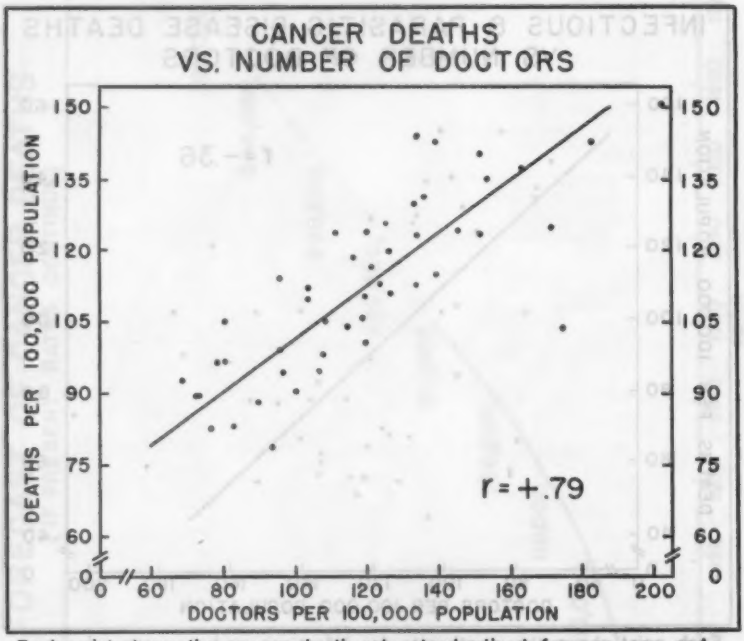

FORECAST OF CANCER DEATHS
(IF PRESENT RATES CONTINUE)
NUMBER OF CANCER DEATHS
YEAR
500,000
400,000
300,000
200,000
100,000
0
1900
1910
1920
1930
1940
1950
1960
1970
1980
2000
41,000
65,000
85,000
118,000
158,000
211,000
249,000
298,000
346,000
387,000
415,000



Each point shows the death rate for infectious and parasitic diseases and the relative number of doctors for one of the 48 states, 1939-1941.

SOURCE OF DATA: VITAL STATISTICS OF THE UNITED STATES

SLIDE 21



Each point shows the cancer death rate standardized for age, sex, and race and the relative number of doctors for one of the 48 states: 1939-1941.

SOURCE OF DATA: VITAL STATISTICS OF THE UNITED STATES

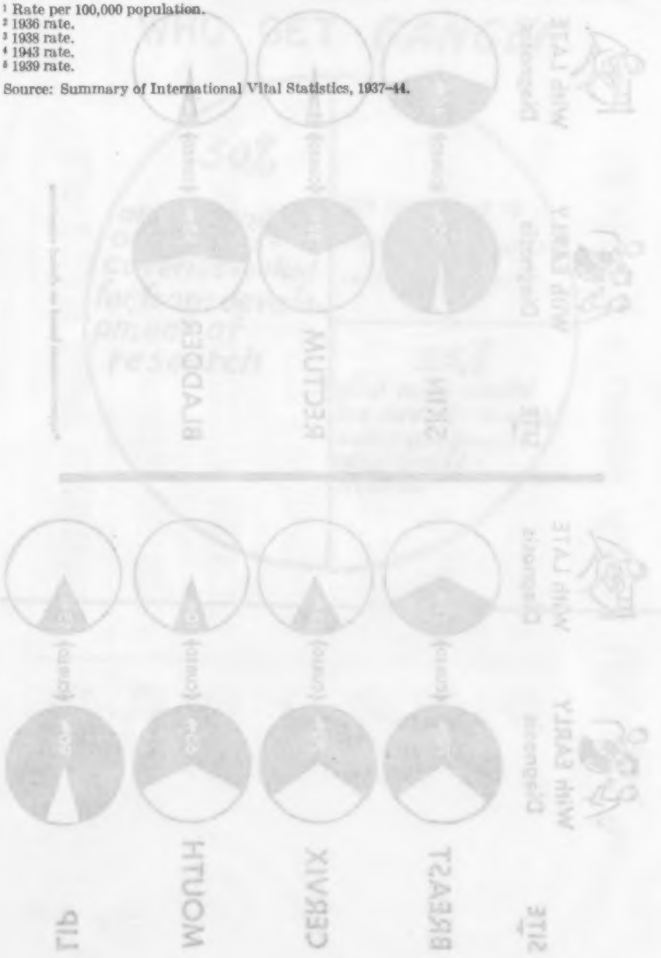
SLIDE 19

CHART 7.—*Death rates, all causes and cancer by country—selected countries, 1940* [1]

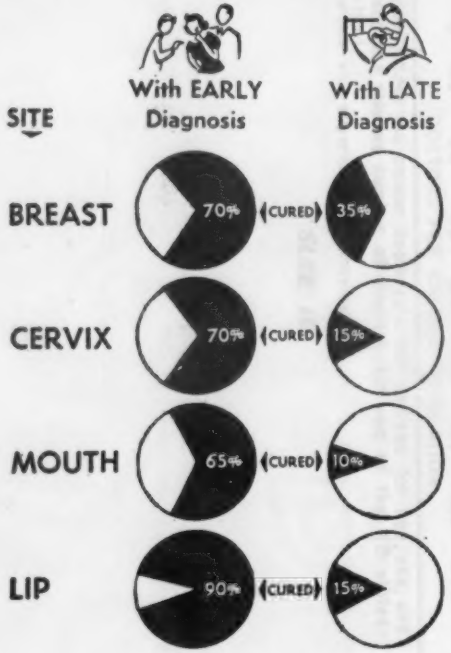
Country	Total rate	Cancer rate	Country	Total rate	Cancer rate
Switzerland	1,201.0	176.0	Egypt	3,034.1	23.2
Argentina [2]	1,195.2	85.4	Mexico	2,235.0	23.2
Germany [3]	1,168.0	146.9	Guatemala [4]	2,146.0	11.4
Sweden	1,141.8	135.7	Chile	2,145.3	69.7
Norway	1,088.0	136.2	Finland	1,895.9	101.6
United States	1,074.1	120.0	France	1,886.9	133.3
Denmark	1,033.5	147.4	Rumania [5]	1,857.6	43.8
Iceland	990.4	126.3	Brazil	1,831.2	63.9
Netherlands	988.0	138.2	El Salvador	1,747.4	12.9
Canada	976.1	117.2	Costa Rica	1,708.7	62.8
Australia	972.4	116.8	Venezuela	1,659.8	25.8
Uruguay	960.3	98.8	Japan	1,652.4	70.9
Union of South Africa	940.3	104.7	Spain	1,641.9	65.3
New Zealand	923.6	120.2	Belgium	1,612.1	119.9

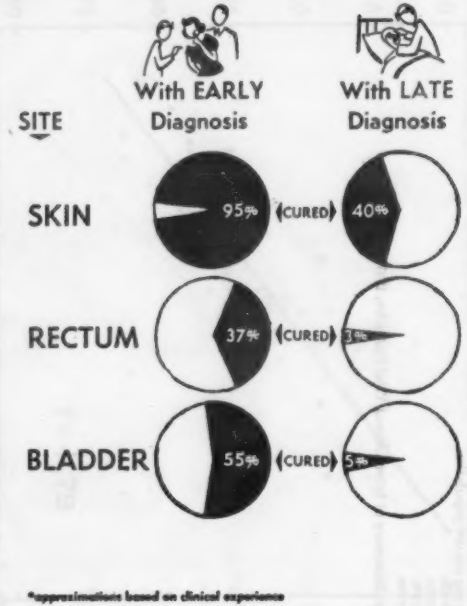
[1] Rate per 100,000 population.
[2] 1936 rate.
[3] 1938 rate.
[4] 1943 rate.
[5] 1939 rate.

Source: Summary of International Vital Statistics, 1937–44.



Early Diagnosis Increases Probability of Cure

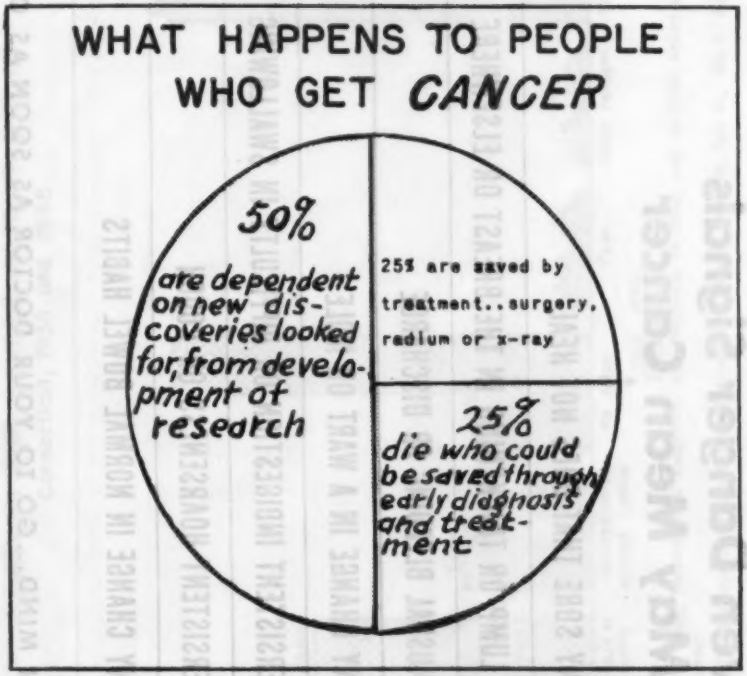




*approximations based on clinical experience

CANCER CONTROL IS UP TO YOU

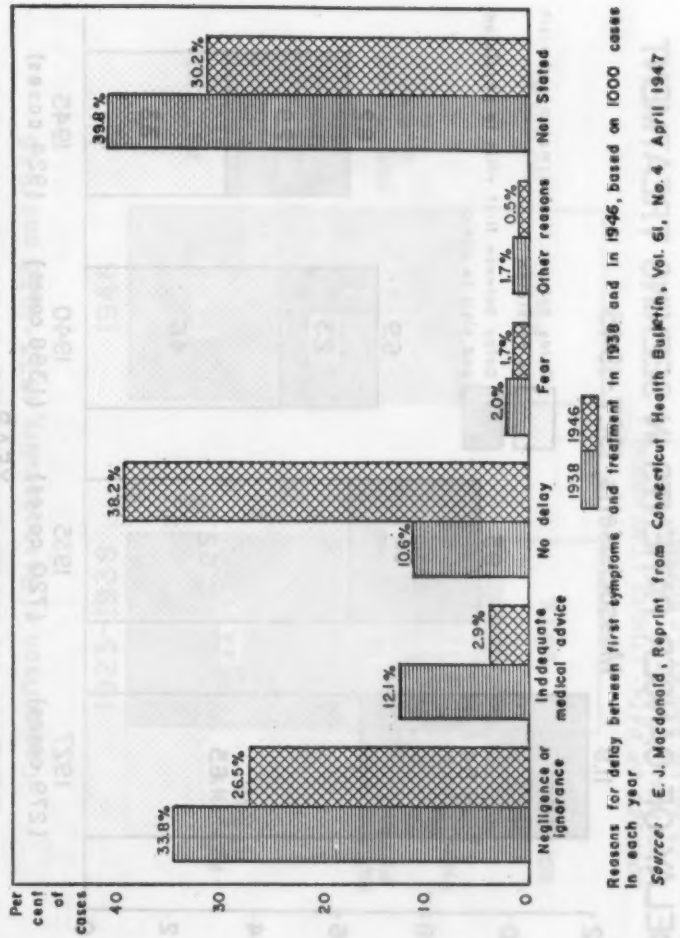
ACT NOW


WHAT HAPPENS TO PEOPLE WHO GET CANCER
50%
are dependent on new discoveries looked for, from development of research
25% are saved by treatment.. surgery, radium or x-ray
25%
die who could be saved through early diagnosis and treatment

The Seven Danger Signals Which May Mean Cancer

1	ANY SORE THAT DOES NOT HEAL
2	A LUMP OR THICKENING IN THE BREAST OR ELSEWHERE
3	UNUSUAL BLEEDING OR DISCHARGE
4	ANY CHANGE IN A WART OR MOLE
5	PERSISTENT INDIGESTION OR DIFFICULTY IN SWALLOWING
6	PERSISTENT HOARSENESS OR COUGH
7	ANY CHANGE IN NORMAL BOWEL HABITS

KEEP THEM IN MIND...GO TO YOUR DOCTOR AS SOON AS ONE APPEARS

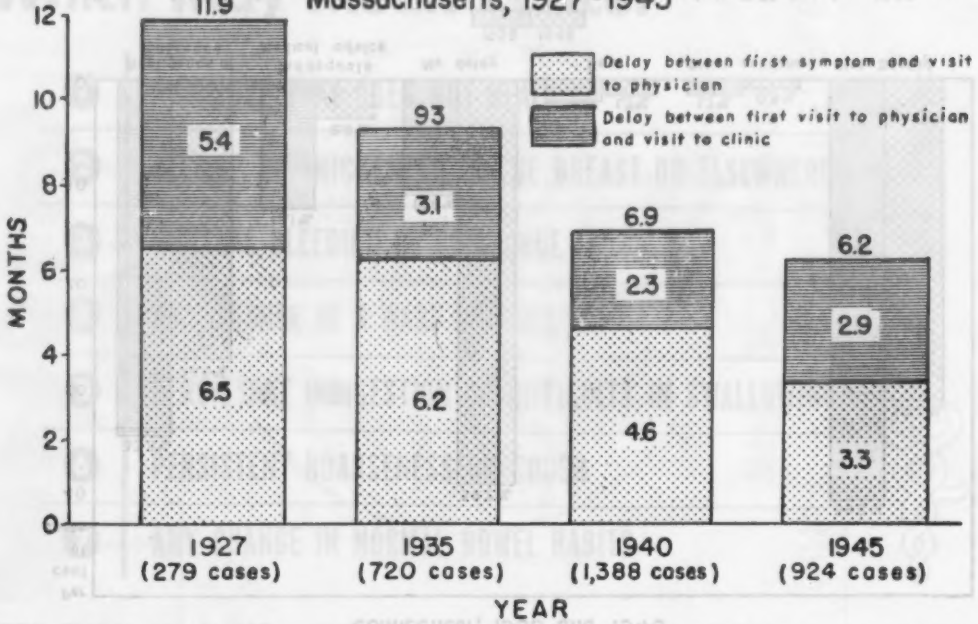


Reasons for delay between first symptoms and treatment in 1938 and in 1946, based on 1000 cases in each year

Source: E. J. Macdonald, Reprint from Connecticut Health Bulletin, Vol. 61, No. 4 April 1947

DELAY OF CANCER PATIENTS IN SEEKING TREATMENT

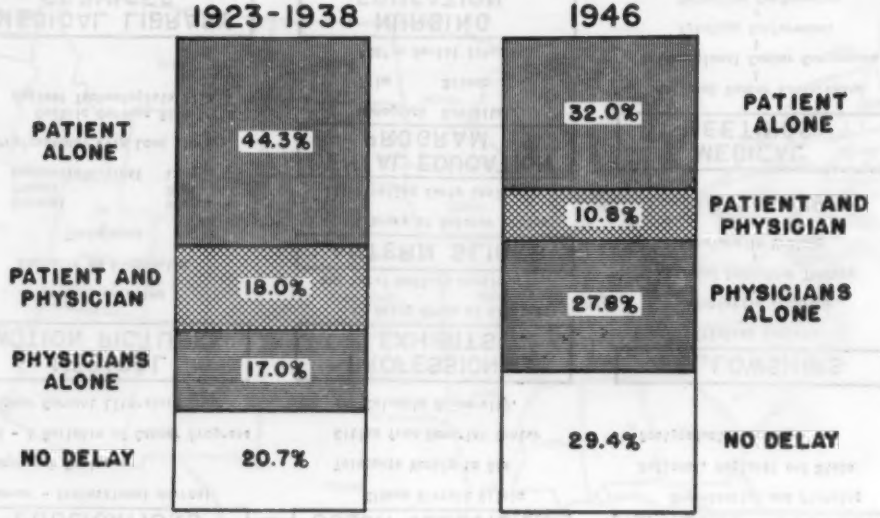
Massachusetts, 1927-1945



Source Massachusetts Department of Public Health-1948

DELAY IN THE DIAGNOSIS OF CANCER

Comparison of Responsibility, 1923-1938 and 1946



SOURCES OF DATA: STUDIES AT MEMORIAL HOSPITAL, N.Y., N.Y., BY G.T. PACK AND J.S. GALLO, AND BY G.F. ROBBINS AND J.E. LEACH.

AMERICAN CANCER SOCIETY
PROFESSIONAL EDUCATION SECTION

PUBLICATIONS

1. Cancer - Professional Journal
2. Monograph Series
3. CA - A Bulletin of Cancer Progress
4. Cancer Current Literature

MEDICAL MOTION PICTURES

Production Films

Emphasis on Diagnostic Techniques

General — Uterus
Breast — Oral
Gastro-Intestinal — Lung

↓

Professional Film Loan Library

↓

Gastric Balloon Film
Medical Technologists Film

MEDICAL LIBRARY SERVICES

Topical Bibliography

Reprint Lending Library

Cancer Current Literature

COLOR TELEVISION

Closed Circuit Clinic

Telecasts Weekly to Six Cities from Memorial Center and Columbia University.

PROFESSIONAL EXHIBITS

17 Being Shown at National and Local Medical Meetings

LANTERN SLIDES

Library of Colored Slides Illustrating Early Lesions.

DENTAL EDUCATION PROGRAM

Monograph — Exhibits
Film — Slides
"CA" - Dental Issue

NURSING EDUCATION PROGRAM

Handbook — Film
Seminars — Exhibits
Scholarships — Advisory Committee

REFRESHER COURSES

Organization and Planning

National, Regional and State Postgraduate Courses

FELLOWSHIPS

Clinical Cancer

↓

Exfoliative Cytology

↓

Advanced Radiation Therapy

↓

Scholars in Urology

MEDICAL MEETINGS

National Cancer Conferences

↓

International Cancer Congresses

↓

Cytology Conferences

↓

Detection Conferences

↓

National Lung Cancer Committees

↓

Annual Meeting Scientific Sessions

CANCER DETECTION CENTERS

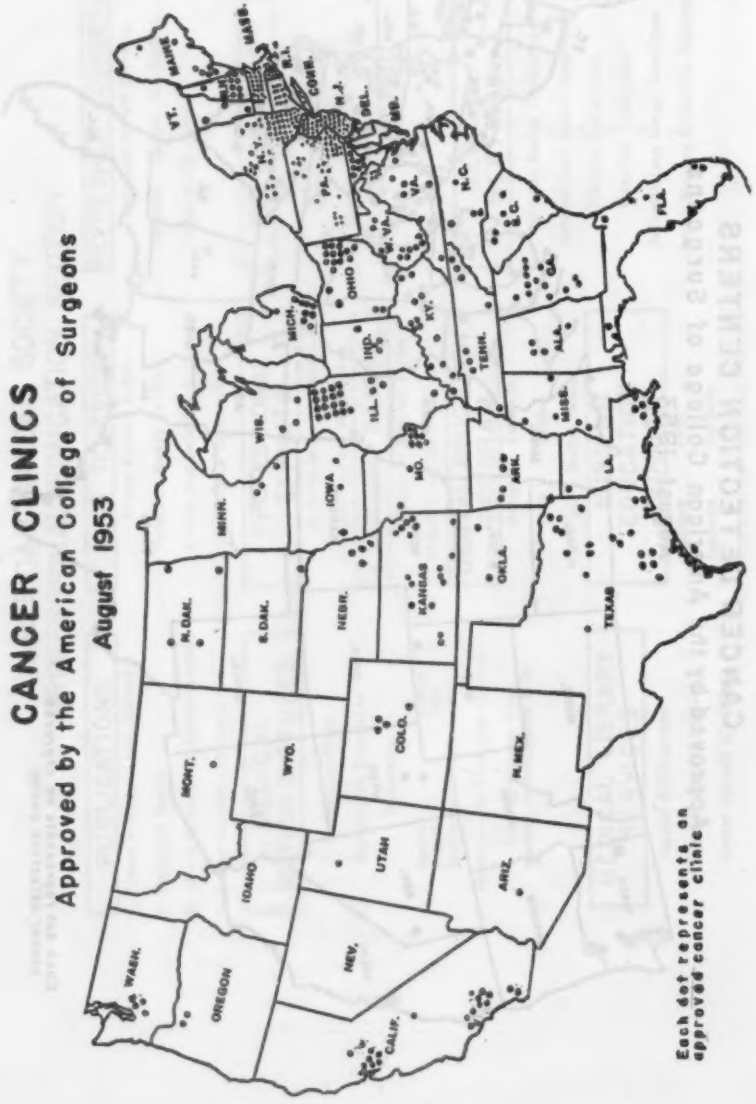
Approved by the American College of Surgeons

August 1953

Each dot represents an approved cancer detection center

CHART 16.—*American Cancer Society detection center survey*

Incidence rate:	*Per thousand*
Under 30	1.2
30 to 39	2.4
40 to 49	3.9
50 to 59	12.4
60 plus	34.3



AMERICAN CANCER SOCIETY
PROFESSIONAL SERVICE SECTION

CANCER CLINICS
CANCER DIAGNOSTIC CLINICS
CANCER DETECTION CENTERS

Financial Support
Assist in Formation of
"Doctor's Office" Program

AID TO INSTITUTIONS

Financial
Personnel

HOME CARE PROGRAMS

Extension Hospital Care to Home

REHABILITATION

Breast Amputees
Colostomy
Limb Amputees
Psychologic Rehabilitation

INFORMATION SERVICES

"Little Red Boors"
Maintained by Divisions.

MEDICAL CARE

Partial Subsidy
Hospitalization
Drugs

LOAN FUNDS

To Temporarily Assist
Medically Indigent.

SOCIAL SERVICES

Follow-up
Personnel
Record Keeping Registries

VOLUNTEER ACTIVITIES

Dressings Program
Transportation Service
Loan-Gift Closets
Occupational and Recreational Aids
Housekeeping Services

NURSING SERVICES

Visiting Nurse Projects
Practical Nurse Participation

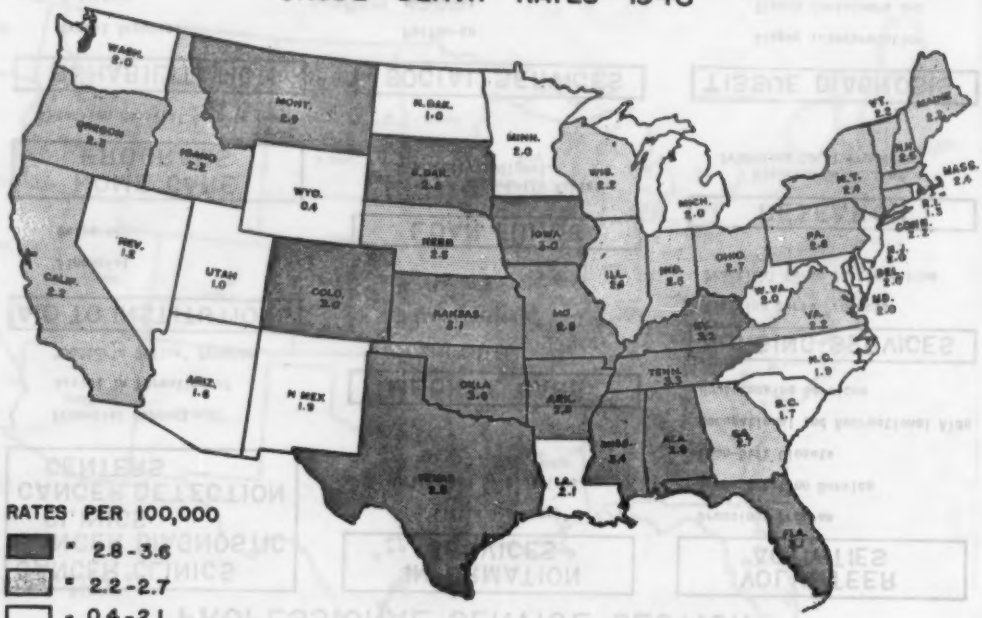
RESEARCH

Division Support of
Promising Local Projects.

TISSUE DIAGNOSIS

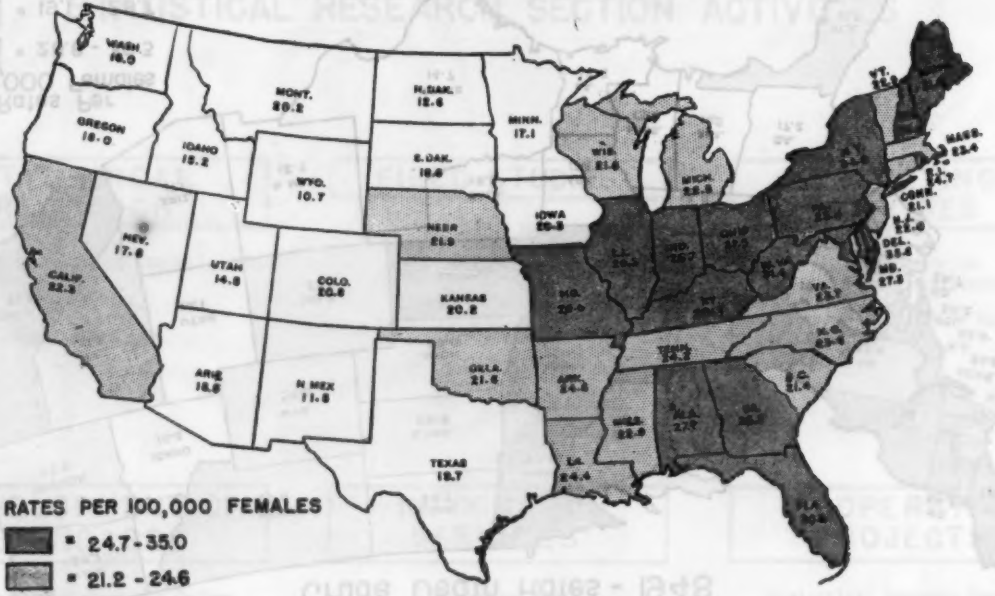
Biopsy Interpretation
Tissue Containers and
Mail Service
Exfoliative Cytology
Services

CANCER OF THE SKIN
CRUDE DEATH RATES- 1948



Source: Vital Statistics of the United States, 1948

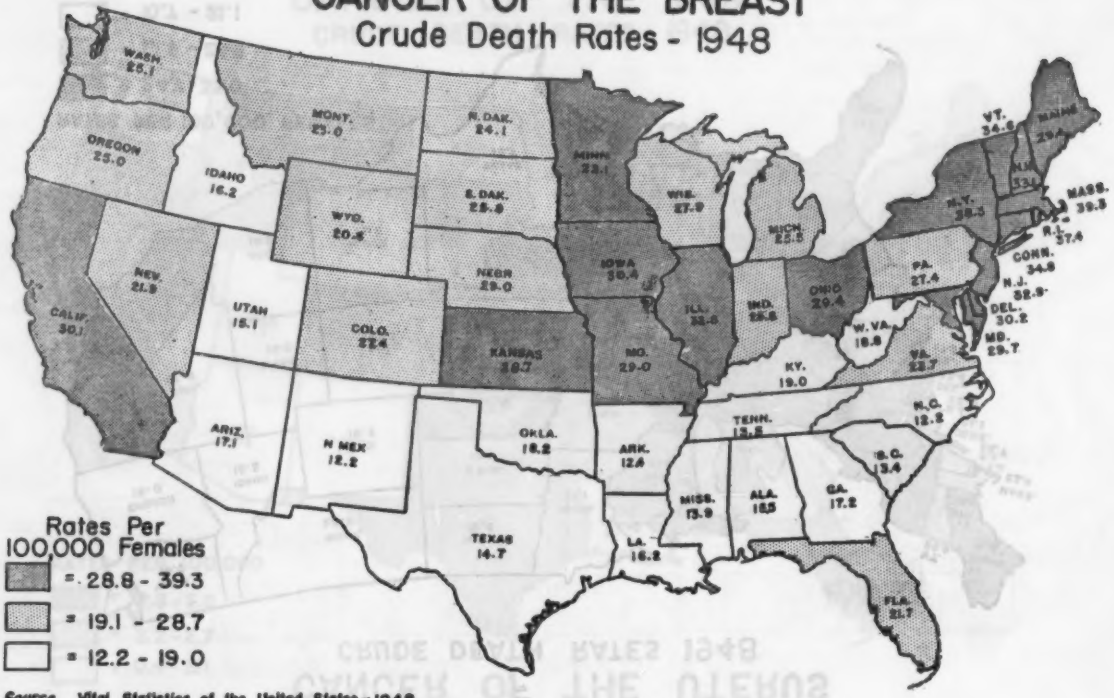
CANCER OF THE UTERUS
CRUDE DEATH RATES 1948



Source: Vital Statistics of the United States - 1948

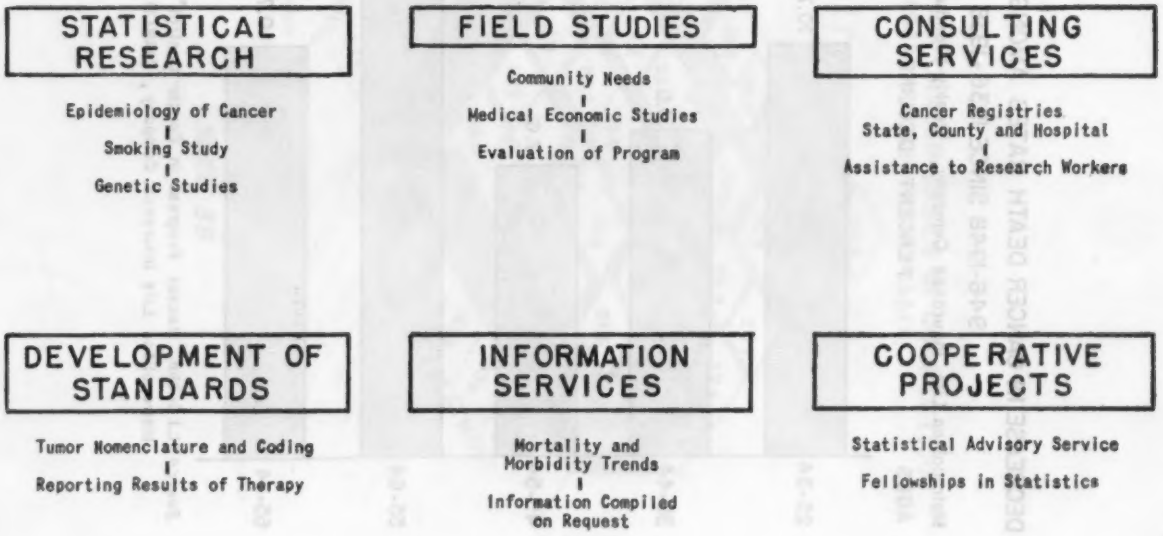
CANCER OF THE BREAST

Crude Death Rates - 1948



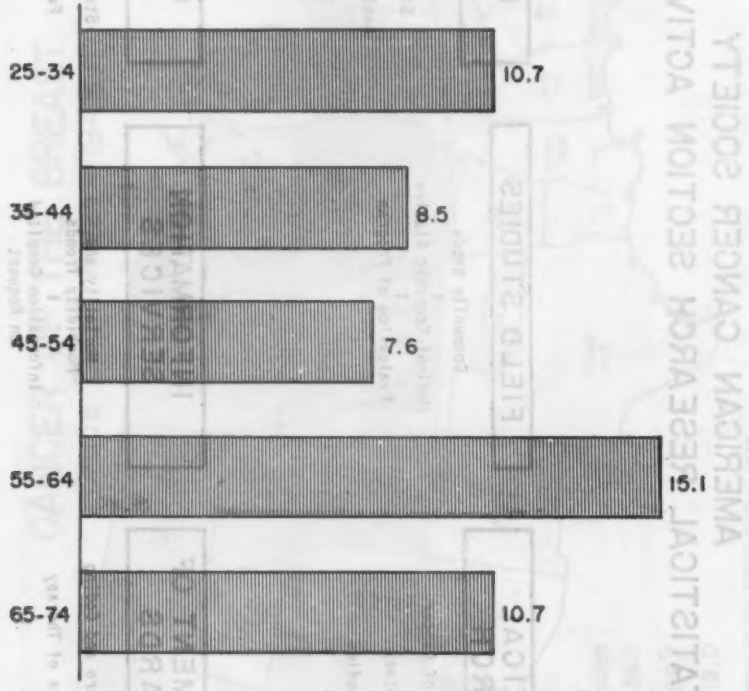
Source Vital Statistics of the United States - 1948

AMERICAN CANCER SOCIETY
STATISTICAL RESEARCH SECTION ACTIVITIES



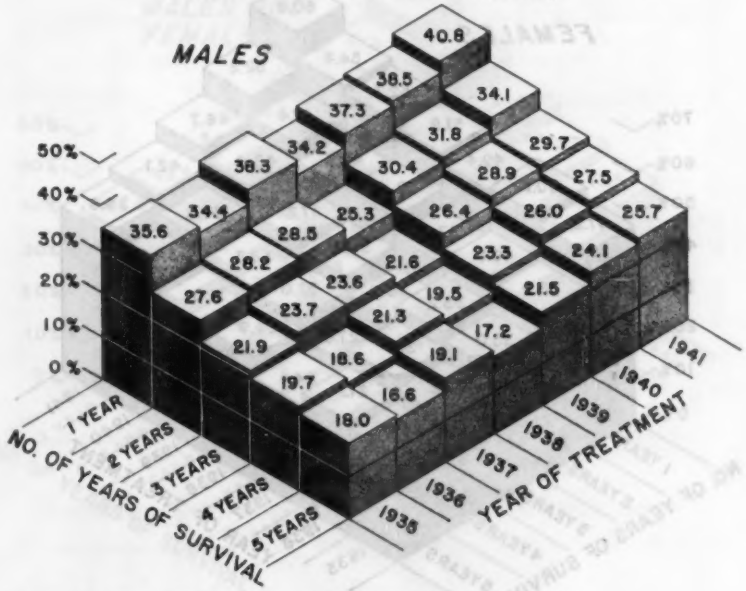
DECREASE IN CANCER DEATH RATES AMONG WHITE WOMEN 1946-1948 SINCE 1936-1938

Metropolitan Life Insurance Company, Weekly Premium-Paying Business



Source: L.I. Dublin, "Recent Progress in Cancer Control"; Statistical Bulletin, Metropolitan Life Insurance Company, MARCH, 1949

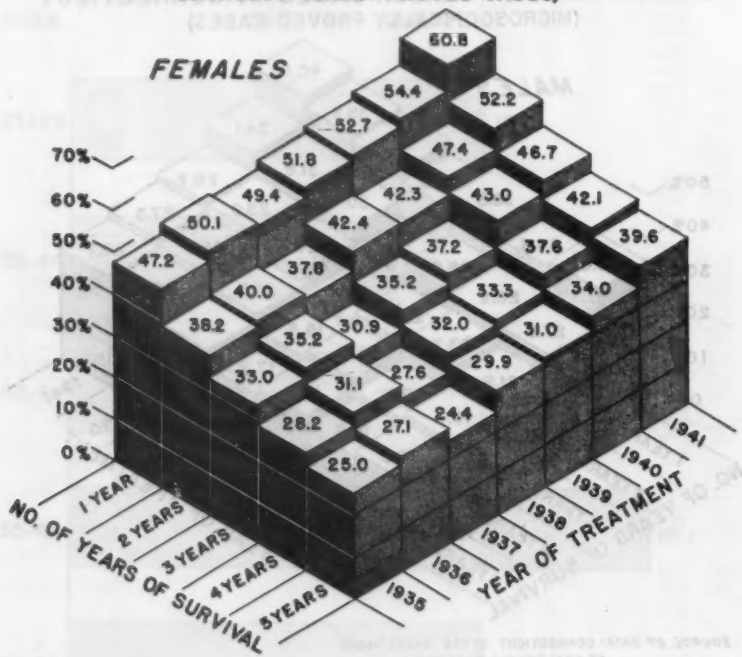
SURVIVORSHIP OF CANCER CASES IN CONNECTICUT
(MICROSCOPICALLY PROVED CASES)



SOURCE OF DATA: CONNECTICUT STATE DEPARTMENT OF HEALTH - E. J. MACDONALD

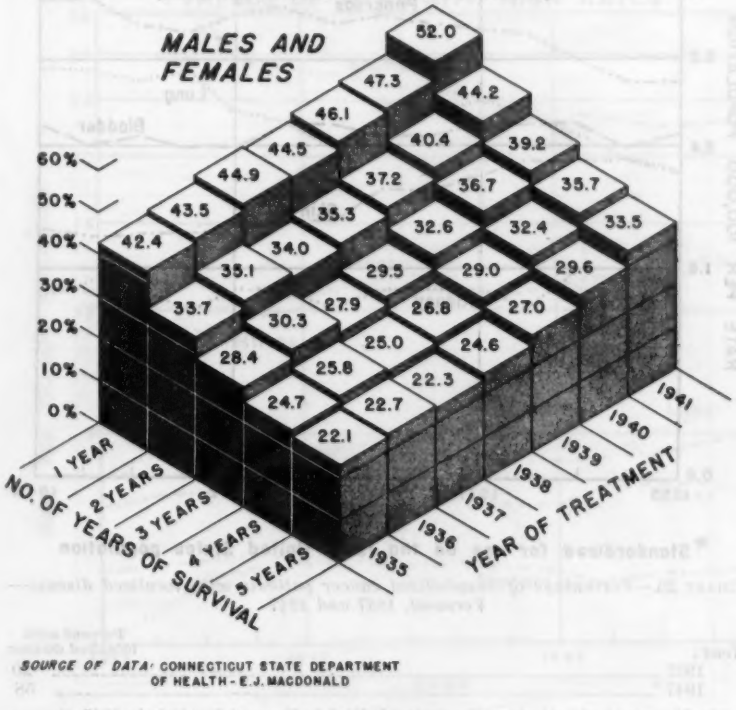
SLIDE 39

SURVIVORSHIP OF CANCER CASES IN CONNECTICUT
(MICROSCOPICALLY PROVED CASES)



SOURCE OF DATA: CONNECTICUT STATE DEPARTMENT OF HEALTH - E.J. MACDONALD

SLIDE 40



SOURCE OF DATA: CONNECTICUT STATE DEPARTMENT OF HEALTH - E.J. MACDONALD

SLIDE 38

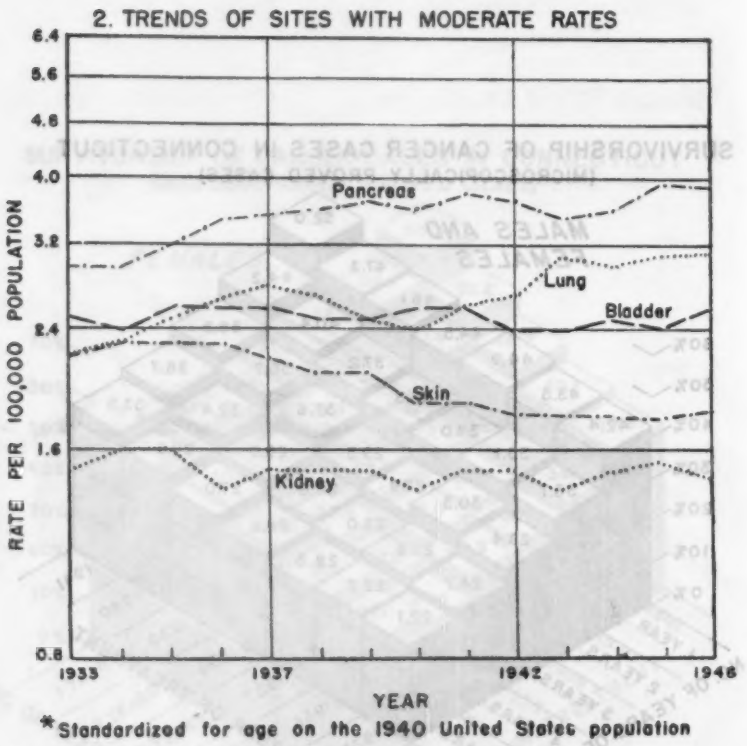


CHART 23.—*Percentage of hospitalized cancer patients with localized disease—Vermont, 1937 and 1947*

Year:	Percent with localized disease
1937	20
1947 [1]	58

[1] In 51 percent of patients with cancer admitted to Vermont hospitals in 1947, therapy was undertaken with curative intent.

Source: American Cancer Society, Vermont Cancer Study, 1948.

CHART 24.—*Percentage of breast-cancer patients with axillary metastases; Mayo Clinic, Rochester, Minn.*

Year:	Percent with axillary disease
1910–19	63.6
1945	45.0

Source: Dr. S. L. Harrington.

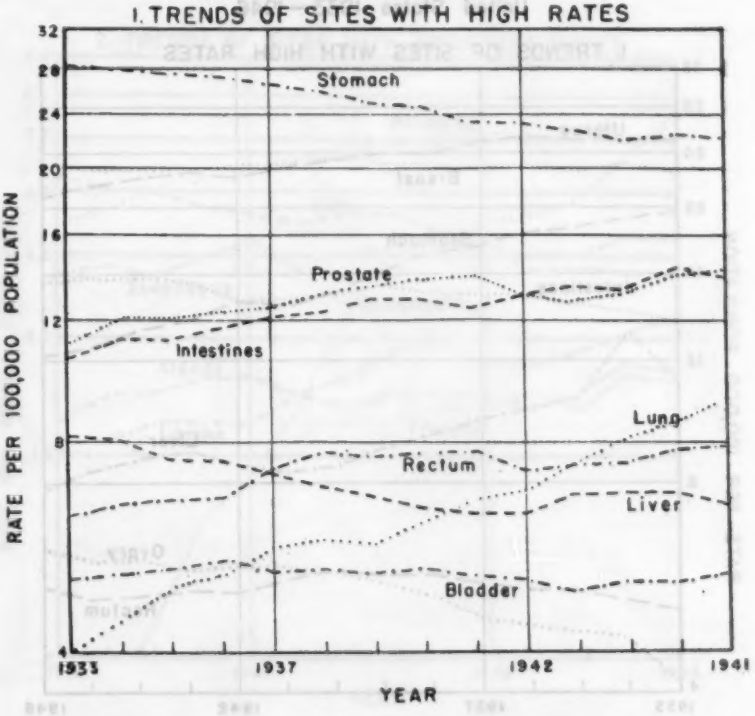
CHART 25.—*5-year survival rate among all patients with operable breast cancer—Memorial Hospital, New York, N. Y.—1936 and 1942*

Year:	*Percent survivors*
1936	47.5
1942	60.2

Source: Dr. Frank E. Adair.

MALE CANCER DEATH RATES* BY SITE

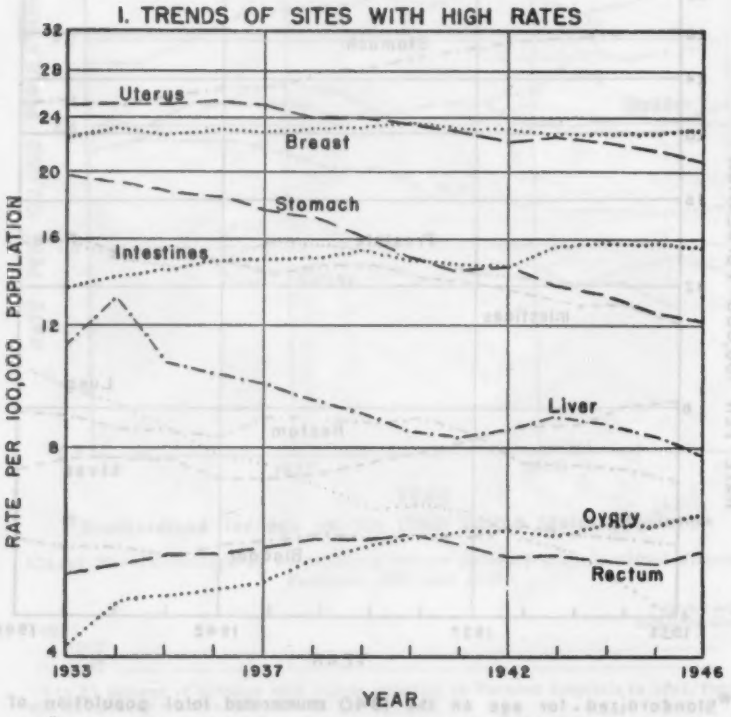
United States, 1933-1946



*Standardized for age on the 1940 enumerated total population of the United States using white male age-specific death rates.

WHITE FEMALE CANCER DEATH RATES* BY SITE

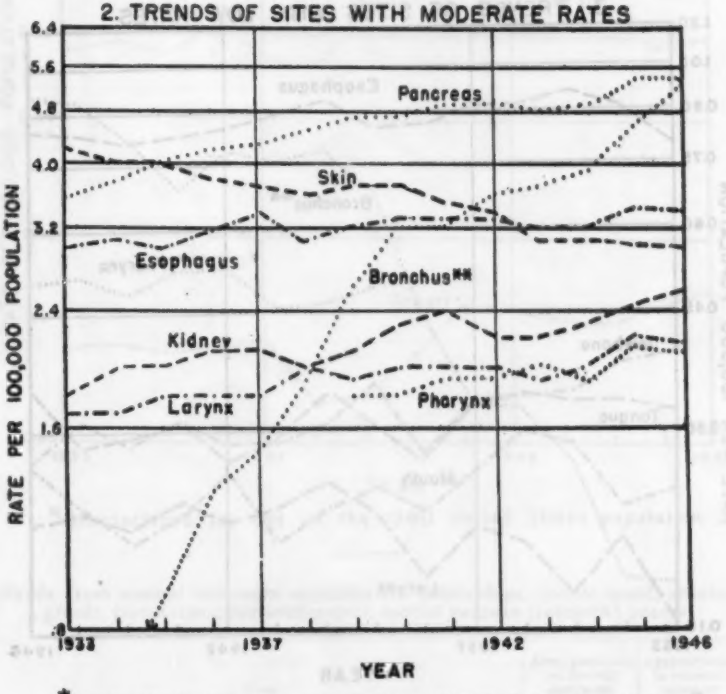
United States, 1933 – 1946



*Standardized for age on the 1940 United States population.

WHITE MALE CANCER DEATH RATES* BY SITE

United States, 1933-1946

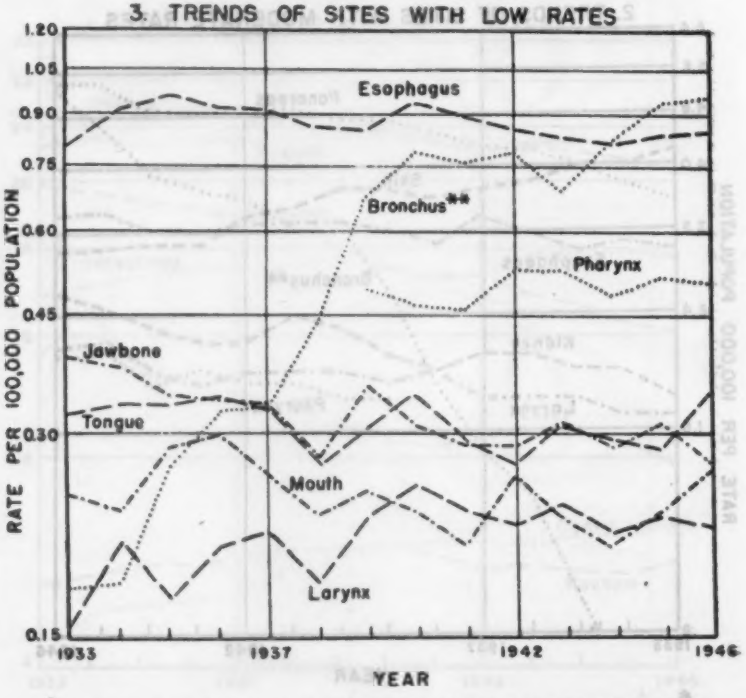


*Standardized for age on the 1940 United States population

**Bronchus-85%; Mediastinum, Trachea, Other Respiratory-15%.

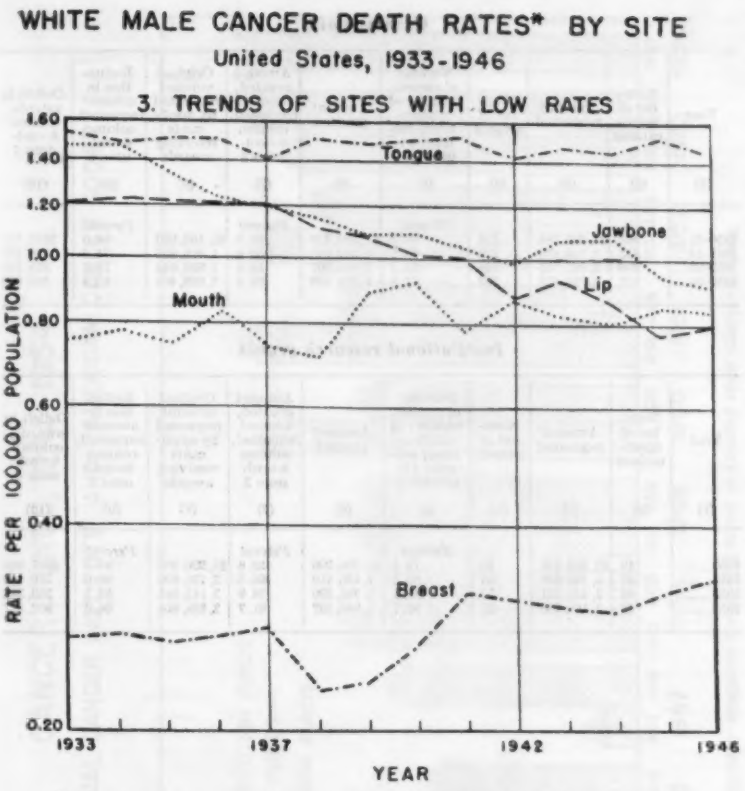
WHITE FEMALE CANCER DEATH RATES* BY SITE

United States, 1933 – 1946



*Standardized for age on the 1940 United States population

**Bronchus – 75%; Mediastinum, Trachea, Other Respiratory – 25%.



Funds from annual campaign available for fellowships, grants-in-aid, scholar grants, institutional research grants, special purpose (research) grants

Year	American Cancer Society campaign receipts year ended Aug. 31	Appropriation to research account national office [1]
1945	$4,292,491.56	$979,047.42
1946	10,106,766.92	2,503,934.50
1947	12,126,875.30	2,996,714.44
1948	13,221,068.76	3,297,973.03
1949	13,596,661.54	3,471,427.41
1950	13,933,638.15	3,476,013.63
1951	14,974,513.69	3,746,966.01
1952	16,438,184.65	4,099,690.69
1953	[2] 19,800,000.00	[2] 4,950,000.00
Total	118,490,200.57	29,521,767.13

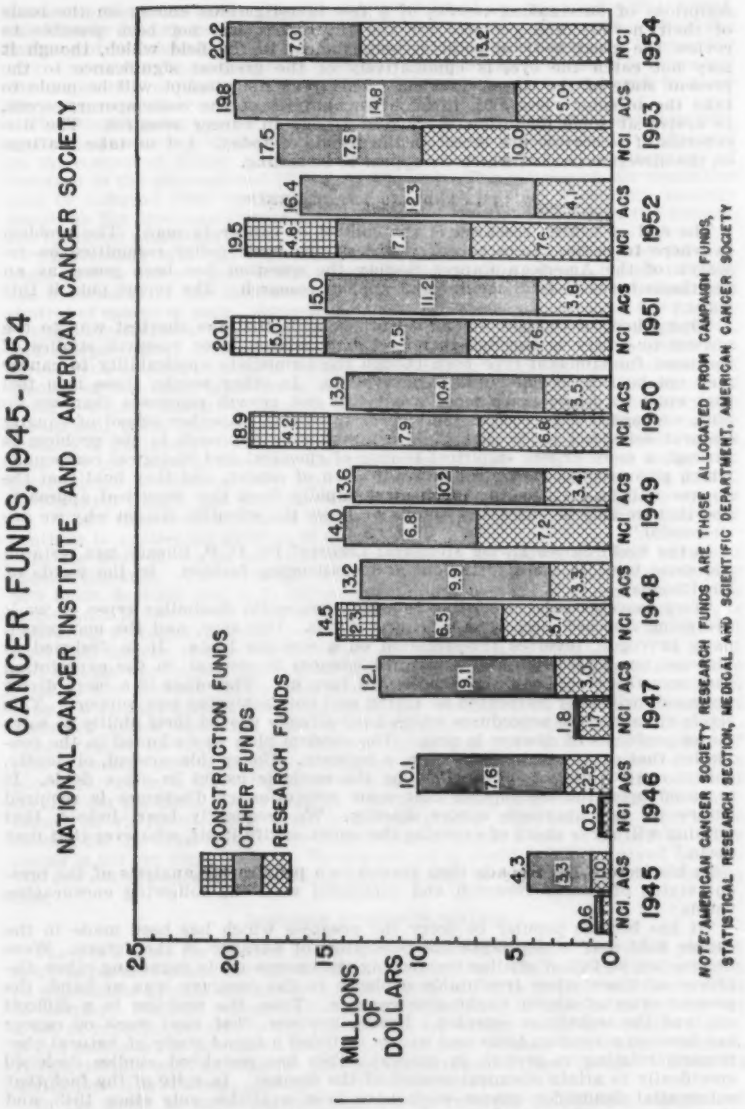
[1] Several divisions of the society through action of their boards have made grants to research within their States.
[2] Latest year estimated.

Grants-in-aid

Year	Number of applications	Amount requested	Number of awards	Number of awards, number of applications, column 4÷column 2	Amount granted	Amount granted, amount requested, column 6÷column 3	Original amount requested by applicants receiving awards	Reduction in amount requested, column 6÷column 8	Deficit in awards, column 8−column 6
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
				Percent		*Percent*		*Percent*	
1950–51	343	$3,293,381	238	69.0	$1,590,429	48.0	$2,163,980	64.0	$573,551
1951–52	333	2,708,623	229	68.0	1,542,215	56.0	1,918,805	75.6	376,590
1952–53	339	2,865,831	248	73.5	1,659,207	58.0	1,999,046	79.6	339,839
1953–54	337	2,753,837	253	74.8	1,758,508	63.8	2,068,468	82.4	309,960

Institutional research grants

Year	Number of applications	Amount requested	Number of awards	Number of awards, number of applications, column 4÷column 2	Amount granted	Amount granted, amount requested, column 6÷column 3	Original amount requested by applicants receiving awards	Reduction in amount requested, column 6÷column 8	Deficit in awards, column 8−column 6
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
				Percent		*Percent*		*Percent*	
1950	40	$2,860,655	36	73.5	$1,599,200	52.8	$1,926,266	83.0	$327,066
1951	38	2,256,620	34	89.5	1,456,410	64.5	2,186,620	66.6	730,210
1952	42	2,475,321	37	88.1	1,780,599	74.9	2,143,984	83.1	363,385
1953	43	3,156,756	39	90.7	1,946,537	61.7	2,838,964	68.6	892,427


CANCER FUNDS, 1945-1954
NATIONAL CANCER INSTITUTE AND AMERICAN CANCER SOCIETY
CONSTRUCTION FUNDS
OTHER FUNDS
RESEARCH FUNDS
MILLIONS OF DOLLARS
0
5
10
15
20
25
NCI ACS
1945 0.6 1.0
1946 4.3 3.3 0.5 10.1 7.6 2.5
1947 1.8 1.7 3.0 12.1 9.1
1948 14.5 2.3 6.5 4.7 13.2 9.9 3.3
1949 14.0 6.8 7.2 13.6 10.2 3.4
1950 18.9 4.2 7.9 6.8 13.9 10.4 3.5
1951 20.1 5.0 7.5 7.6 15.0 11.2 3.8
1952 19.5 4.8 7.1 7.6 16.4 12.3 4.1
1953 17.5 7.5 10.0 19.8 14.8 5.0
1954 20.2 7.0 13.2
NOTE: AMERICAN CANCER SOCIETY RESEARCH FUNDS ARE THOSE ALLOCATED FROM CAMPAIGN FUNDS,
STATISTICAL RESEARCH SECTION, MEDICAL AND SCIENTIFIC DEPARTMENT, AMERICAN CANCER SOCIETY

SIXTH ANNUAL REPORT, COMMITTEE ON GROWTH—TRENDS IN CANCER RESEARCH

INTRODUCTION

The research program of the American Cancer Society has now been in operation for 6 years. The committee on growth is responsible for advising the society on the design and direction of this program. In the past the major part of the annual report of the committee has been devoted to de-

scriptions of outstanding results of a few investigations chosen on the basis of their novelty and promise for the future. It has not been possible to review the great body of solid accomplishment in the field which, though it may not catch the eye, is cumulatively of the greatest significance to the present state of the cancer problem. This year the attempt will be made to take the broader view and, through an analysis of the contemporary scene, to arrive at some definition of current trends in cancer research. The discoveries of tomorrow are latent in the trends of today. Let us take bearings on the direction toward which we appear to be sailing.

THE END AND THE BEGINNING

The end of cancer research is the control of cancer in man. The problem is where to begin. In a recent report of the basic policy committee on research of the American Cancer Society the question has been posed as an antithesis between fundamental and applied research. The report puts it this way:

"One school of thought among scientists holds that the shortest way to the answer to cancer is through increased emphasis on basic research studies of the most fundamental type even though the immediate applicability to cancer may not be full, evident, and demonstrable. In other words, these men feel that until we know much more about life and growth processes than we do now, we cannot hope to find the answer to cancer. Another school of equally eminent scientists holds that the most promising approach to the problem is through a more or less empirical testing of chemical and biological compounds which give promise of control or eradication of cancer, and they hold that the answer will be forthcoming much more rapidly from this empirical approach, and that we may be successful before we know the scientific reason why we are successful."

In the Sixth James Ewing Memorial Lecture[1] Dr. C. P. Rhoads has restated the same issue in more forthright and challenging fashion. In the words of Dr. Rhoads:

"Two concepts exist according to which two quite dissimilar types of work are going forward supported by cancer funds. One type, and the one principally in vogue, involves investigation on a random basis. It is designed to increase our knowledge of the natural sciences in general, in the expectation that something applicable to cancer will turn up. The other is a more direct approach originally advocated by Ewing and now achieving new support. This levels at cancer the procedures which have already proved their ability to solve major problems of disease in man. The random plan was adopted in the conviction that cancer is a special case, a mystery. Under this concept, obviously, cancer control cannot be attained by the methods useful in other fields. It is based upon the assumption that some revolutionary disclosure is required before we can approach cancer directly. We frequently hear, indeed, that nothing will serve short of exposing the secret of life itself, whatever that may mean."

In his lecture Dr. Rhoads then turned to a penetrating analysis of the present status of cancer research and concluded with the following encouraging words:

"It has become popular to decry the progress which has been made in the cancer field and to deprecate the possibility of advance in the future. Were history not so full of similar melancholy statements made regarding other disorders at times when irrefutable evidence to the contrary was at hand, the present cries of alarm might give concern. True, the problem is a difficult one and the techniques complex. Recall, however, that most work on cancer has been on a random basis and so has included a broad study of natural phenomena relating to growth in general. This has restricted studies designed specifically to attain chemical control of the disease. In spite of the fact that substantial funds for cancer work have been available only since 1945, and that only a small part of them has been allotted to therapeutic studies, the progress has been gratifying, indeed."

This question of the balance between fundamental and applied research is one which almost always arises when administrative aspects of research are under scrutiny. It is well that it should do so because it is undeniable that those who control the pursestrings of research are in a position to exert a profound in-

[1] Bull. N. Y. Acad. Med., vol. 27, No. 10, October 1951.

fluence on the areas of investigation on which emphasis is placed. The American Cancer Society invests nearly $4 million annually in research and in the training of men for research. About half of this large sum of money is awarded on the advice of the committee on growth. Those whose business it is to control the disposition of these funds have an obligation to apprehend and to avow the measure of their responsibilities and their limitations.

The committee on growth, from its inception, has affirmed the conviction that, while the research program of the American Cancer Society should be focused on the control of cancer in man, it should be built upon the broadest base of research in the physical and biological sciences. The policies of the committee may be inferred from the foreword to the third volume of reprints recently issued by the American Cancer Society. Reviewing the contents of the volume, the foreword comments:

"This volume is a fair representation of the breadth and sweep of the program as it is today. In it will be found clinical studies which attempt to bring the discoveries of the laboratory to the bedside for the better detection and control of cancer in man. Supporting these, and providing the basis for further clinical applications, are a bewildering diversity of biochemical, biophysical, and morphological studies of experimental tumors and of carcinogenic and carcinolytic agents. These, in their turn, had their origin in still more general studies of the basic phenomena of growth and metabolism in all manner of living systems. Examples of such work will also be found here. Superficially considered, these studies may seem to make no obvious contribution to the problem of malignancy. Yet, without them the stream of clinical progress would soon dry up. New power, new means of control, new tools can be brought to the clinician no more rapidly than the crude ore of knowledge can be mined.

"No royal road to the solution of the problem of cancer has yet been opened up. Until that road has been mapped and finger posted we must diligently continue to explore all avenues of approach."

In the field of cancer no valid distinction can be drawn between pure and applied research. The investigator in the basic sciences is constantly developing new ideas, devising new tools and exploring new methods of approach which he refines and passes on to the clinical investigator. The latter, as constantly, is redefining problems, passing back new leads, testing out ideas at the clinical level and, thereby channeling the effort of the random investigator. The direct and oblique approaches are not so much competitive as complementary. The issue is not between alternative strategies. If you are faced by a stubborn enemy, a frontal assault is strengthened, not weakened, by a simultaneous and sustained attack upon his lines of communication and his source of supply. Concentration of effort is good strategy when you have taken the measure of your opponent, have counted his resources and has found his weaknesses. It is poor strategy in a war of maneuver when you are still feeling him out, still seeking out his main line of defense. In this situation, pressure must be maintained on all fronts. One must probe continually anywhere and everywhere looking for the weak spots. The war on cancer is still a war of maneuver. The enemy is not yet pinned down. We are not yet in position for the grand assault. We are not yet sure what types of weapons will be most effective in subduing him.

RESEARCH BY REMOTE CONTROL

There is a place for planned research in the field of cancer. There is a place, a more important place, for the random investigator. The role of the former is to consolidate ground already won, that of the latter is to seek out new worlds to conquer. Planned research can take a defined body of knowledge and lay out a set of experiments which will exploit this knowledge to its foreseeable limits. It can take a set of postulates and drive them home to their rational conclusions. It can do this with exhaustive thoroughness, economy, and speed. Within its limitations it is efficient, expedite, and authoritative.

In the world of ideas, planned research is research in blinders. Organized research is inclined to follow the fashions. As Henry Allen Moe has remarked, "It is precisely when a field has become modish and accepted, when its vested interests are at their highest, that it tends to become sterile." One cannot plan new ideas because one cannot plan for the unexpected. Now, if there be one lesson which the faithful disciple of science learns the hard way, it is that new ideas are to be sought down the road of the unexpected. An experiment that fails is the beginning of understanding. It tells the alert investigator that the reasoning behind his experiment was inadequate. It tells him that his original

idea must be abandoned, that he must go off on a fresh tack, following the unexpected clue wherever it may lead, in the faith that he will finally emerge with a new, more valid, principle. The remote controller, on the other hand, tends to be impatient of experiments that fail. They upset his well-laid plans. He is inclined to dismiss them as irrelevancies, as irritating eccentricities of nature. The imaginative investigator who has actually made the unexpected observations welcomes them because he knows that nature betrays herself in her eccentricities rather than in her adherence to conventional behavior.

The business of the administrator in research is to choose the men to do the work, to apprehend the significance of their ideas, to provide them with the tools, and to keep open the lines of communication. One cannot chart the unknown. The individual investigator must be given the freedom to seek out new knowledge in his own way. The experiments which he will conduct must be left to his own intuitive compulsions. They cannot be directed by remote control. Interests will change and emphasis will shift as new techniques and new ideas remold his thoughts. The wind bloweth where it listeth. One cannot control the changing winds of ideas. The best that the administrator can do is to be alert to the shifting climate of thought so that he may trim the sails of his effort to the best advantage.

PREVENTION OR CURE?

Although no valid distinction can be drawn between pure and applied research in the field of cancer, the issue can be restated in a form that does appear to have some cogency. Should the major effort be concentrated on the prevention or on the cure of cancer? Should the American Cancer Society encourage the pursuit of investigations directed toward a better understanding of the root causes of cancer or should it throw the main weight of its support behind such therapeutic approaches as offer the greatest immediate promise?

Cancer is a disease of individual cells. The weight of evidence points to the conclusion that malignant cells are not merely normal cells "on the loose." They are abnormal specifically modified cells. They are disordered rather than disorderly. This is implicit in the fact that their abnormal characteristics, once established, are passed on to the progeny of the aberrant cells. The cells have suffered what appears to be an irreversible physical change. A physical change must have a physical cause. If we could but discover the indigenous causes of these malignant changes we would be entitled to hope that we may be able to devise rational means to neutralize these causes.

This is the goal of prevention. A few extraneous causes of cancer, such as undue exposure to ionizing radiations and to a variety of industrial chemicals are already known. To avoid these it is necessary only to exercise proper care. The natural causes of cancer are more elusive. The geneticists have established, beyond doubt, that the susceptibility of particular tissues in animals to particular tumors is influenced by hereditary factors. At the same time, it has been shown that susceptibility to some of these tumors is also influenced by certain of the hormones of the host. A few animal cancers, moreover, can be transmitted from animal to animal by viruslike bodies. These facts are clues to the causes of cancer which are being intensively pursued at the present time. How far they will take us we know not. We do not yet see clearly what the relations are between hereditary susceptibility and the actions of invading inciters such as the viruses and the chemical cancerogens. We do not understand the ways in which the aging process and the hormone balance in the host modify his susceptibility to cancer. It may transpire that malignant changes are a hazard intrinsic to the very nature of living cells. The elimination of the hazard may not be compatible with life. The secret of cancer may lie so close to the secret of life itself that its quest is hopeless. This may prove to be so, but we can scarcely give up the quest before we have well begun. The search for the natural causes of cancer is and will be intensively and unremittingly pursued. It is the ultimate objective of cancer research.

Cancer, however, is not a potential hazard. It is a very present scourge for which a present cure must be sought. We know that cancer can be cured if it is localized and is accessible to the surgeon's knife or to the X-ray beam. The urgent and compelling challenge of cancer is the detection and control of hidden and diffuse malignancies. This is a dual problem in diagnosis and in cure. The presence and distribution of the malignancy must first be established. Some chemical agent must then be found which will be carried by the blood stream to the cancer cells and will destroy them without destroying essential functions of normal tissues. This is the challenge of cancer chemotherapy.

The seeker after causes starts from the premise that some physical cause—some inciter agent—has imposed upon the cell a heritable change in the normal processes of growth and differentiation. He studies the effects of radiation, of carcinogenic chemicals, of viruses and of hormones on the physicochemical machinery of the cell in the hope that these will provide clues to the nature of the malignant disorder. He is particularly interested in the nucleus of the cell because it is the nucleus which is the dea ex machina of heredity. It also appears to be the controller of the synthetic processes which are essential to growth and multiplication. At the same time, he recognizes that the nucleus and the cytoplasm are so interrelated that agents ultimaely modifying the functions of the nucleus may have their origin or their primary effect in the cytoplasm. Consequently, he is forced to concern himself with all of the functional activities of the cell in his search for the root causes of the malignancy. In a word, the whole field of cellular physiology is his province.

The object of the seeker after cures is to find some chemical agent which will arrest the multiplication of cancer cells without destroying normal tissues. Faced with millions of available chemical compounds he will not be expected to engage in the enterprise on a purely hit-or-miss basis. The odds are all against him unless he is provided with some clues to the selection of plausible candidates. It is possible that he may stumble upon an effective agent by chance, that is to say, by being alert to apprehend the significance of some unexpected observation. But he does not plan to leave it to chance. He begins by selecting some metabolic reaction on which he has reason to believe the malignant cell is more dependent than are normal cells and he then selects chemical compounds which may be expected to inhibit this essential reaction. He is, naturally, concerned to know how radiations and known chemical cancerolytic agents destroy cancer because he wishes to imitate and improve upon their actions. He studies the effects of those hormones that control the growth of tumors for the same reason. At the present time he is particularly interested in the metabolism of the nucleus because he has reason to hope that this may be the most vulnerable point of attack on the malignant cell.

The seeker after diagnostic tests soon finds himself exploring the same territory. Many of the tests that have been devised for the detection of cancer appear to have been purely empirical in origin arising from some chance observation. Others have been rationally based upon inferences drawn from observed metabolic anomalies in cancer patients. Such chemical tests as are available at present are not very discriminating. The hope for the future surely lies in a fuller understanding of the chemical details of metabolism and the anomalies that may be associated with cancer.

The substance of the argument which has been developed above is that the seekers for causes and the seekers for cures or for tests may pose their questions differently. They may start with different objectives but they find themselves exploring the same ground. Their paths are not separated. They cross and recross. Each in the pursuit of his own quest depends upon the progress made by his fellow explorers. It is quite possible that the next major advance in chemotherapy will arise from a chance observation made in the course of a general study of the metabolism of growth. It is equally possible that the next new idea about the natural causes of cancer may emerge from systematic chemotherapeutic investigations in man.

THE CORE OF THE PROBLEM

The cancer problem is a problem in the behavior of living cells. Now, the living cell is a chemical machine. It lives and moves and has its being by the energy which it derives from the chemical reactions carried out within itself, using the chemicals on which it feeds as its fuel. Moreover, it renews its own structure, it keeps its machinery in good working order by repair processes which use these same foods as construction materials. Each type of cell has its own peculiar structure and its own particular functions and conducts its chemical transactions in its own unique way. If its structure or its activities change its chemical traffic will also change. If some cells of a tissue continue to grow and multiply when their neighbors have ceased to do so it is because the aberrant cells are pursuing a pattern of chemical behavior different from that of the community. A malignant cell must differ chemically from a normal cell because it behaves differently. If we are to control the growth of tumors by means other than complete removal we can do so only by controlling their chemical reactions.

In the final issue, the cancer problem is a biochemical problem. In no degree does this statement detract from the importance of biological studies which

do not involve chemical techniques. The relation of hereditary factors to susceptibility to cancer, the transplantability of cancers, the transmission of tumors by filterable agents, the growth of tumor cells in tissue culture, the influence of hormones and of external agents on susceptibility to and growth of tumors, the attempts to develop antibodies to tumors, all these and many other studies are essential contributions without which biochemists would have nothing to investigate. In the end, however, our objective must be to describe all of these biological phenomena in chemical terms.

The difficult problem is to know where to begin. The biochemical answer does not lie on the surface. The cancer cell puts up a good front of normalcy. It does not wear its chemical aberrations on its sleeve. A chemical analysis of the cell, the best analyses that it has been possible to make of the chemical reactions by which it lives and grows, have revealed little or nothing to account for its asocial behavior. Yet we know that there are, there must be, differences. That they have eluded us up till now is no cause for dismay. Our knowledge of the chemistry of normal cells is still fragmentary. We are only on the threshold of an understanding of the complexity of molecular organization which makes a single minute cell a going concern—a machine of incredible diversity of function so uniquely adapted to the activities that it sustains.

Until recent years our knowledge of cellular organization came largely from studies with the microscope. The chemist was able to give little help. The situation is, however, changing rapidly and the cytologist and the biochemist are coming close together. The refined techniques of the cytochemist, the penetrating eye of the electron microscope are now reaching down to levels of organization far beyond the visual microscope. At the same time the chemist, having sharpened his wits and refined his tools in the study of relatively simple molecules, is beginning to make real progress in the much more difficult task of describing the giant molecules which are the organized components of living cells.

The chemist no longer conceives the cell as a protein jelly into which nutritive materials permeate and within which a turbulent riot of chemical reactions is in constant progress. He now recognizes what the biologist has long insinuated, that the cell is a well-organized factory comprising many types of subunits. These function as separate compartments dedicated to make specific chemical contributions to the overall economy of the cell.

The subunits of the cell include a variety of particulate structures such as the chromosomes of the nucleus and the mitochondria, microsomes and other particulate bodies of the cytoplasm. They have long been familiar to the microscopist. The chemist is just beginning to get to know them. Within recent years he has developed methods of separating them from cells and from one another without destroying some of their physiological activities. He is now busy studying the reactions of the isolated subunits in order that he may define their chemical functions in the life and growth of the cell. The power of a machine is in the organization of its parts. The power of a living cell, likewise, is in the organization of its components. Malignant cells may not differ strikingly from normal cells in gross chemical composition. It is a plausible hypothesis, therefore, that their abnormal behavior may reside in abnormalities in the way their components are organized into functional structures.

Students of growth are, naturally, concentrating attention on the chromosomes of the nucleus because these play so dominant a role in cell multiplication and in the transmission of the inherited characteristics of the cells that contain them. Chromosomes consist essentially of a combination of protein with an almost equally complex type of matter called nucleic acid. A great deal of contemporary work is being devoted to the chemical characterization of the nucleic acid of different types of cells, to the identification of the foodstuffs from which nucleic acid is manufactured in the cell, to measurements of the rates at which it is built up and broken down in the cells of different tissues and to the effects of chemotherapeutic agents on these rates of manufacture and destruction. All such information is manifestly pertinent to the problem of the control of the multiplication of cells.

Much of the particulate material of the cytoplasm also contains nucleic acid. The latter differs in characteristic ways from the nucleic acid of the chromosomes and the particulates in which it is present contribute differently, but significantly, to growth. There is increasing evidence that some of the cytoplasmic units share with the nucleus the control of the rate of protein synthesis in cells. In recent years, moreover, evidence has accumulated that some cytoplasmic particles share with the nucleus in the transmission of certain heritable qualities of cells.

Viruses are organic particles with the capacity to invade and multiply within cells for which they have a specific affinity. They, likewise, are composed largely of nucleoprotein. Indeed, viruses, the particulates of cytoplasm and the ultimate particulate units of chromosomes, known as genes, have so much in common, chemically and biologically, that there is a growing feeling that they may represent variants of a common pattern of organized vital material. This thought will be further developed in later sections of this report because it may have a profound influence on theories of normal and malignant growth and, therefore, on the future course of experimental work on growth. It is mentioned at this point only to emphasize the importance of the many studies of the chemistry and the metabolism of nucleic acid which are now in progress.

Although, at the moment, nucleic acid is much in the public eye its rate of synthesis is not necessarily the controlling factor in the rate of growth of cells. The major component of protoplasm is protein and, quantitatively speaking, the rate at which growth can occur is limited by the rate at which the cell synthesizes protein. Currently, there is wide interest in this problem. It is one of the many problems of metabolism which was scarcely open to experimental attack until the availability of isotopes made possible the use of tracer techniques. Even so, progress will be slow because proteins are so complex and so specific in structure that their total synthesis by cells must be conceived to be a most elaborate process. On the other hand, results of significance to cancer may well arise at any stage in the elucidation of the problem. As soon as any single step in the process has been established methods of blocking that step with chemical agents will suggest themselves. These may well open new vistas for cancer chemotherapy.

The building-up (anabolism) of protoplasmic components requires a supply of chemical energy. The breakdown (catabolism) of foodstuffs or of protoplasm releases energy. A cell can grow because it is able to use energy released by the oxidation of some of its food to supply the energy required to convert the rest of the food into protoplasm. The great mystery of the chemistry of the cell has always been the manner in which the cell has achieved this energy-coupling process. The difficulty is this. When chemical energy is released it has a habit of degenerating into heat. Now heat is a useless form of energy to an organism that operates at constant temperature—at least it is useful only to keep him at constant temperature. Evidently the cell has some method of storing the energy of catabolism as chemical energy until it is needed, for synthetic processes. The biochemist is beginning to learn how the trick is turned. It appears that this energy is stored in certain labile phosphate compounds in the cell. The layman who scans the current literature of biochemistry will be intrigued by the frequent recurrence of such hieroglyphics as ATP, ADP, DPM, and TPN. These are symbols representing various phosphate compounds which form the transmission belt of energy in the cell. They are molecular storage batteries that are charged up when food is oxidized. They can then be switched into circuit with synthetic reactions and discharged to provide the energy required by the latter processes. Since growth is dependent on this power supply as well as on the supply of raw materials it should be possible to control growth by controlling the energy-coupling process which has been described: If this argument be accepted, then it will have to be conceded that the student of growth is just as much concerned with catabolic reactions as with anabolic processes. The latter are dependent on the former. More than this, he dare not restrict his interest to the metabolism of proteins and nucleic acids. The oxidations of sugars and of fats are the chief sources of phosphate bond energy. He who would control growth may have to take into consideration the whole panorama of chemical reactions comprised in the metabolism of sugars, fats, proteins and nucleic acids. No aspect of metabolism can, a priori, be dismissed as having no pretense to the problem of cancer. So sweeping an assertion may, perhaps, be overstating the case. On the other hand, the view is widely held that we do not yet know enough about the chemistry of cancer to delimit the field. We cannot afford to close any doors.

Until recently we knew few of the individual steps in the chain of conversion of raw materials into the end products of their metabolism. We knew what went into the organism and what came out. We could strike a balance sheet of these. What series of chemical changes went on within the cell was very much a matter of enlightened surmise. All this is now changed. The most revolutionary advance in the field of metabolism in recent years has been the almost universal adoption of isotopes as tracers of metabolic pathways. The principle of tracer studies has been described in many places and need not be repeated here. Suffice to say that it does make possible the ultimate mapping out of a complete flow

sheet of the fate of a given substance in the body. Already information is accumulating at an intoxicating pace. The biochemist, at last, has the tool which will enable him to probe the inner recesses of living processes and he is making the most of it.

Those who assert that medicine is slow in bringing new tools to its service should ponder the story of the isotopes. Seven years ago isotopes were available to a privileged few. In the last 5 years the supply to medical laboratories has increased 20-fold. The bill for isotopes for cancer research alone now amounts to $1 million a year. This development was not accomplished without a profound and concerted effort. Instruments for the manipulation and measurement of isotopes had to be designed and produced in quantity. Investigators had to learn how to use these instruments and how to adapt them to their particular needs. They had to train themselves and, then, to train their students in the quite novel techniques required for the safe and proper handling and measurement of radioactive materials. A profound reorientation in laboratory customs and habits was imposed upon them. The rate of growth of isotopic studies is a tribute to the versatility, awareness and willingness to discard the old for the new on the part of investigators in medicine and the medical sciences.

In the pages that follow an attempt will be made to show that the biochemist and the biophysicist have now refined their techniques to the point that they are ready to join hands with the geneticist, the cytologist, the microbiologist, and the endocrinologist. When groups of investigators using different vocabularies reach common ground and begin to use a common language several worlds merge into one. There have been dramatic advances in the field of cancer in the past decade. None, however, have been so signficant and so encouraging as the drawing together of the biologist, the chemist, and the physicist in the unified attacks on the same problem.

GENETICS AND CANCER

Genetics has probably contributed more than any other field to advance our understanding of the causes of cancer. In this story the mouse has been cast in the leading part. There are good reasons for the choice. The mouse is a mammal, subject to many characteristic types of tumors. Its life span is short and it breeds rapidly. Large colonies of mice can be maintained under controlled conditions at reasonable cost and many generations can be produced and studied within the span of a few years. Nevertheless, 30 years of tedious effort have been devoted to the analysis of the hereditary factors affecting certain types of tumors in mice. The chemist who wishes to study the chemical reactions of selected substances with one another must begin by preparing pure compounds. The geneticist who would investigate the way in which certain traits of an organism are inherited must begin by preparing pure strains of the organism with clearly defined differences in the chosen traits. Only then is it possible to interpret with confidence the systematic programs of cross-breeding that form the core of his experiments. Pure strains are obtained by brother to sister matings for 20 or 30 generations. The mills of heredity grind slowly.

As a result of these sustained studies of the mouse several important conclusions are now clearly established. In the first place, different strains vary greatly in their susceptibility to a particular tumor. Some strains, for example, show a negligible incidence of mammary cancer. In other strains one may anticipate not only that every mouse that survives long enough will develop such a cancer, but may even predict the approximate time at which the tumor will become evident. Comparable strain specificities for tumors of the lungs and the liver and for leukemia have been established. In the second place, a strain with a high incidence of tumors of one type may have little or no susceptibility to other kinds of cancer. There is no escape from the conclusion that the incidence of several types of tumors in mice is under genetic control and that each type of tumor is a separate genetic problem and must be studied separately. Similar, though less comprehensive, studies have established the same broad conclusions with respect to a variety of malignant growths characteristic of other mammals, of birds, of fishes and, even, of plants.

Incidentally, acknowledgment should be made of the fact that the work of the geneticist has contributed not only to the understanding of the hereditary components of cancer but has been of inestimable benefit to students investigating malignant growths from quite different points of view. One of the great advances of the past 20 years has been the rendering available to all investigators who want them a variety of strains of mice with well-defined sensitivity or

resistance to particular types of tumors. Only with such pure strains, in which the incidence of tumors of various types is predictable, is it possible, for example, to obtain consistent results on the potencies of cancer-producing or cancer-destroying agents. General acceptance of the practice of using pure strains has resolved many of the contradictions found in earlier studies and has greatly speeded progress.

Overdosage of animals with X-rays, with radioactive emanations and with ultraviolet radiations results in the development of malignant growths of various sorts. It has been established that these radiations also increase the rate at which heritable changes in all kinds of characteristics of organisms occur. Such spontaneous or induced changes are called mutations. Appropriate dosage of animals with certain chemical substances, commonly referred to as carcinogens, will also lead to tumors. There is evidence that a number of these chemicals will also increase mutation rates in general although no clear correlation between carcinogenic and mutagenic potency has been established. Nevertheless, the hypothesis that the cancer cell is a mutant cell is an appealing one and has found many adherents. The genetic point of view is so cogent to the main theme of this report that it merits further definition.

Body cells multiply by increase in size followed by division. The daughter cells are faithful reproductions of the parent so that growth may be described as a process of self-duplication of cells. Cell division appears to be initiated by a complex series of changes in the nucleus. In the course of these, a bundle of filamentous structures—the chromatin network—separates into individual filaments, called chromosomes, which proceed to split lengthwise. The duplicate halves separate and reassemble to form two new chromatin bundles at opposite ends of the cell. The cell as a whole then divides to form two new cells each of which carries a nucleus which, by inference, contains a complete replica of the chromosomes of the parent. Thus the nucleus and the individual chromosomes as well as the cell as a whole have this unique property of self-duplication.

All this can be seen under the microscope. Where vision ends the eye of the scientific mind takes over to project events into the invisible. Current ideas in genetics rest upon one of those magnificent flights of imagination that change the face of thought and create new worlds. The basic idea is the concept of the gene. Genes are conceived to be the ultimate units of heredity. They are assembled in the nucleus like strings of beads to form the chromosomes. Each gene differs from its neighbors and each occupies its own particular place in the chromosome. Like the ultimate particles of matter, genes are invisible. They are recognizable only by their effects. The observable effect of a gene is on some particular trait of the cell that contains it. Each heritable characteristic of the cell is assumed to be determined by the character of a single gene or of a group of genes acting together. The gene theory is the atomistic theory of cell personality.

When each chromosome duplicates itself, each gene is assumed to reproduce itself without alteration of its position in the chain. The daughter cells contain a faithful reproduction of the genic pattern as well as the genic composition of the parent. This, according to the theory, is the physical basis of the faithful reproduction of the heritable qualities of the cell.

Occasionally the machinery of ordered duplication goes wrong. This is inferred from the observation that the progeny of a particular cell differ in some characteristic way from the parent and continue to produce offspring with the same modified character. A heritable variation—a mutation—has occurred. It follows, from the basic premise of the gene, that, sometime in the life of the parent cell, some physical or chemical change in one or more genes, or some change in the relative positions of the genes in the chromosomes has occurred. These modified genes, or gene patterns, reproduce themselves and a new strain is launched upon its course.

In recent years new horizons have been opened up by the demonstration that a mutation in a single gene may result in a single metabolic disability. That is to say, a particular gene is responsible for the control of one specific chemical reaction within the cell. These biochemical developments of genetics hold such great promise for the future that the type of experiment on which they are based merits illustration.

It will be assumed that the investigator has elaborated a nutrient medium of known composition on which a particular strain of organism will grow and reproduce. From the components of this medium the organism is able to synthesize all the constitutents of its protoplasm. Let one of the nutrients be A and let it be assumed that this is converted to the protoplasmic constituent Z. This

relation could readily be established by appropriate tracer studies. In the course of breeding the organism, a mutant strain is isolated which is unable to grow on the original medium. It will, however, grow when substance A in the medium is substituted by substance B. The original strain will also grow on the modified medium. Appropriate tests then show that B is converted to Z both by the original and by the mutant strain. The conclusion from all this is that the original strain is able to convert A to B and B to Z. The mutant organism also converts B to Z but is unable to produce B from A. The defeat in the mutant is narrowed down to an inability to conduct one single chemical reaction in the myriad reactions which comprise its total metabolism. The one missing link makes the difference between growth and no growth.

It is a short step from this conclusion to the demonstration that the mutant cells lack an enzyme (i. e., a specific catalyst) necessary for the conversion of A to B. Patient exploration leads to the isolation of other mutant strains which will not grow when A is substituted by B but will grow when C or D or E respectively is the substitute nutrient. The biochemist now assumes direction of the work. Bit by bit he pieces together the links in the metabolic chain and emerges with a convincing argument that the metabolic pathway of A is through B to C to D to E and so to Z. He demonstrates that each step requires its own specific enzyme and that each enzyme is under separate genetic control. The sweeping hypothesis develops that the genes control the complement of enzymes that a cell contains. The genes cease to be hypothetical units responsible for the biological characteristics of organisms. They become definite chemical entities with definite chemical relations to the life of the cell that contains them.

The biochemical developments of genetics were not undertaken in the name of cancer research. They emerged from basic investigations of the nutritional requirements of micro-organisms. They have been seized upon and are being vigorously exploited as new and powerful ways of exploring the chemical pathways of metabolism. They have also been recognized as having great significance to the problem of cancer. If the cancer cell is conceived as a mutant cell, it is reasonable to infer that it will differ from normal cells in its conduct of certain specific chemical reactions. If these anomalies can be uncovered, the logical point at which to attack the concer cell with chemical weapons will have been laid bare. This argument is justification enough for the patient, deliberate, and systematic search for nutrients on which malignant cells are more dependent than are normal cells and for drugs to which the cancer cells are specifically sensitive.

The foregoing discussion of genetics has emphasized the predominant part that is played by the nucleus in the transmission of heritable qualities. There is no doubt that this emphasis is correct. In recent years, however, evidence has been accumulating to indicate that the role of the cytoplasm is not entirely passive. This story centers around a large unicellular micro-organism known as paramecium. Paramecium has peculiar reproductive habits. These can be controlled experimentally in such a way as to produce, at will, daughter cells containing identical genes in different cytoplasms or those with different genes in the same cytoplasm. This is obviously an ideal situation in which to discriminate between nuclear and cytoplasmic contributions to inheritance.

The work which has been done on paramecium cannot be summarized in a few words. Suffice to say that the transmission of certain unique heritable characteristics of this organism appear to be under the control of the cytoplasm. Similar conclusions have been arrived at in studies of some plant species and yeasts. The results can best be interpreted by assuming that transmission is effected through self-duplicating entities located in the cytoplasm. Since these units are the vehicle for the transmission of heritable traits from generation to generation, since they have the capacity to multiply in the cells that contain them and since, as we shall see, they are prone to undergo mutations, they are much like the genes. Indeed, they are often referred to as plasmagenes. There is evidence that plasmagenes are located in some of the microscopically visible particles of the cytoplasm which have been referred to in an earlier section. If this should prove to be general these particulates would be the cytoplasmic counterparts of the chromosomes of the nucleus.

Plasmagenes are probably not able to function independently of the genes. Their ability to multiply seems to be dependent on genic factors so that genes and plasmagenes operate cooperatively in realizing the genetic potentialities of the cells that contain them.

The duplication of genes is always synchronized with cell division with the result that successive generations of cells contain the same numbers of genes. The plasmagenes appear to have a freedom of action denied to the genes in the

closely knit structure of the chromosome. A plasmagene usually multiplies at about the same rate as the cell but, in certain circumstances, may multiply either more rapidly or more slowly. In the former case, its concentration in the cells will increase in succeeding generations and the character of the strain may become progressively modified. When the multiplication rate is reduced below that of the cell the plasmagene is gradually diluted out and the trait which it controls is ultimately lost.

The interesting observation has been made that plasmagenes may compete with one another for survival. When conditions favorable for the initiation of 2 different plasmagenes are imposed on a cell the result may be that only 1 of the potentialities develops. It is as though the more aggressive factor multiplied at the expense of the other. This competition for survival is of particular interest because, as we shall see, it is a characteristic also of some mixed virus infections.

Plasmagenes are more subject to environmental influence than are genes. Their multiplication may be modified by such factors as the temperature and the food supply of the cells. A special case that is under intensive investigation at the present time is that of the production of adaptive enzymes by yeast cells. It has long been known that yeasts that have the power to metabolize only a few of the simple sugars can be taught to metabolize a foreign sugar by incorporating the latter in the food supply. The new metabolic capacity takes time to develop but when established it is passed on to succeeding generations as long as the foreign sugar is present in the environment. The cells have acquired the capacity to synthesize a new enzyme to deal with the alien nutrient. When the latter is withdrawn from the nutrient medium the capacity to metabolize it is lost because the essential enzyme is no longer synthesized and disappears from the yeast cells in a few generations. Quantitative analyses of these phenomena are best explained by the assumption that a plasmagene is responsible for the synthesis of the enzyme and that the plasmagene only multiplies when the foreign sugar is present. This is one more example of the way in which genetics is currently spilling over into biochemistry.

The cancer cell has been described as mutant cell. It is a difficult matter to decide whether a mutation in a body cell is the result of a change in the nucleus or in the cytoplasm. Genes and plasmagenes probably interact so intimately with one another that the decision which of them suffered a mutation may not be of the first importance. The purpose of this discussion is to emphasize two other aspects of these hereditary units. The first is that both genes and plasmagenes are nucleoprotein structures. Their multiplication, therefore, is a problem in nucleoprotein metabolism. The second point is also biochemical. It is that genes and plasmagenes, alone or in cooperation, are closely linked up with specific metabolic reactions through their control over the synthesis of specific enzymes. A mutation in a gene or a plasmagene may, therefore, be expected to be associated with the appearance of a specific metabolic anomaly in the mutant cells.

That susceptibility to a particular type of cancer is dependent on genetic factors is a conclusion that has derived from studies of pure strains of animals. The mating habits of man are so haphazard that the possibility of the existence of human strains with different sensitivities to cancer is inconceivable. Indeed the evidence that susceptibility to cancer is inherited in man is almost entirely lacking. This does not mean that studies of the genetics of cancer can contribute little to the problem of human cancer. Actually genetic studies probably have done more than any other field of work to illuminate the paths which are currently being followed in the chemotherapy of cancer in man.

VIRUSES AND CANCER

About 40 years ago it was reported that a sarcoma growing in a Plymouth Rock hen had been transmitted to other chickens by the injection of a cell-free extract of the tumor. When, moreover, extracts of the induced tumors were prepared it was found that these would infect other birds and that serial transmission of the disease could be continued indefinitely. The extracts could be dried and preserved without loss of infectivity and the potencies of extracts from successive generations of tumors remained about the same. These observations obviously pointed to the presence of an agent which was able to multiply in the tumor cells, could survive when separated from the cells and could induce sarcomatous growth in normal chicken tissue. That is to say, this tumor appeared to be associated with a viruslike body although it must be recorded that the spon-

taneous transmission of the tumor from one bird to another by contagion has never been observed.

This work was soon confirmed and stimulated a diligent search in all manner of tumors for evidence of virus origin. In spite of widespread and persistent effort the results were meager. Apart from a few other avian tumors, certain skin growths in rabbits, a malignant growth in frogs, and 1 or 2 curious tumors in plants the results were essentially negative. The thesis that cancer was a disease caused by viruslike agents was not sustained by the evidence.

About 12 years ago interest in the problem was revived by an arresting report from one of the best known laboratories of genetics in this country. The report was concerned with the results of crossbreeding two pure strains of mice. One was subject to a high incidence of breast cancer while the other showed little susceptibility to this type of tumor. The incidence of mammary tumors in the offspring was found dependent on whether the mother or the father belonged to the cancer-susceptible strain. Following up this unexpected observation it was soon found that it was not the strain of the mother that gave birth to the young that determined susceptibility but the strain of the female that suckled them. The female offspring of a mother of the cancerous strain did not develop breast cancer in later life if fed by a foster mother from the non-cancerous strain. Conversely, the female young of a mother of the latter strain became susceptible when suckled by a female from the strain with a high incidence of cancer. A single feeding would suffice. Once susceptibility was established in a female it was passed on from generation to generation by the milk. Susceptibility to this type of cancer was, therefore, a heritable characteristic which was transmitted through the milk rather than through the germ cells.

From the milk and tissues of susceptible mice a cell-free material was obtained which was infective when injected into very young mice. This milk factor has the general characteristics of a virus, notably the capacity to multiply in the cells of the host. It shows a curious latency in action inasmuch as injection or feeding the virus is effective only for a short period after birth yet the cancers do not develop until late in adult life. The milk factor is related to mammary cancers only. It does not influence the incidence of other types of tumors. It is not even essential for the production of breast cancer since some strains of mice that do not carry the agent are susceptible to this type of tumor. On the other hand, wild mice have been shown to transmit the agent without developing the disease. It would appear that the cancerous effect of the virus requires a favorable genetic constitution in the host.

The discovery of the milk factor has done much to reawaken interest in the relation of viruslike agents to cancer. Brief consideration of the general characteristics of viruses is, therefore, appropriate. A virus may be described as an infective agent with an affinity for certain specific cells in certain limited species and with the capacity to multiply in these cells with the production of a characteristic diseased state. All manner of living things—the higher and the lower animals, plants and micro-organisms—are prey to attack by their own particular groups of viruses. Because of favorable experimental conditions much of what we know about viruses is derived from those that induce diseases unrelated to cancer. Indeed, much of what we know comes from studies of the viruses of plants and bacteria. This information, though it does not relate to cancer directly is of the greatest significance to the interpretation of studies on the transmission of cancer.

Viruses are particulate bodies. They can be visualized in the electron microscope. They vary considerably in size. The smaller ones show little evidence of structural organization but the larger ones exhibit a variety of differentiated structures. Chemists have succeeded in purifying some of the simpler viruses. A few of the plant viruses have actually been crystallized testifying to a high degree of chemical homogeneity. The simpler viruses have been found to be composed chiefly of nucleoprotein. Other more complex viruses have been shown to contain fat and carbohydrate in addition to nucleoprotein.

The question whether viruses are substances or organisms has often aroused vehement debate. The issue itself is probably debatable and current thought is content to conceive viruses as bodies lying in that twilight zone between the giant molecules of some proteins and the most minute of organisms. The biologist concedes that they are living organisms in respect of their ability to reproduce themselves but he emphasizes the extreme parasitic character of their life. They exhibit few, if any enzyme activities of their own. They cannot be grown on artificial media because they do not have the machinery with which to

metabolize nutrients. They are able to multiply within host cells because they are able to exploit to their own ends the labor of the cells in which they live. They rely upon the cells to manufacture protein and nucleic acid and they then pervert these products to the synthesis of viral substance. Like a barbarian army of occupation the viruses live off the land that they have captured.

In this competition with the needs of the cell the virus may be so successful that the cell starves and dies. The virus is thereby released and is free to invade and destroy other cells. If, however, the growth of the virus is restrained, the host cell may survive but must be regarded as a modified cell in that it harbors an alien component and has suffered a perversion of its metabolism. When the cell divides the virus will be carried into the daughter cells as a heritable component which will be transmitted as long as it multiplies at a rate comparable with that of the host cells.

Viruses will also compete with one another. When two viruses invade a single cell the more aggressive one may inhibit the multiplication of the other. Alternatively, both may survive but each may modify the characteristics of the other. The chemist would say that they have interacted with each other. The biologist might prefer to say that each had suffered a mutation. Certainly viruses are prone to mutate when subjected to modified environments. Their virulence, for example, may often be increased or diminished by passage through types of host cells that are not their usual habitat. This capacity to change in virulence has been effectively exploited in the preparation of attenuated viruses for use as vaccines.

An interesting characteristic of certain tumor viruses, such as the milk factor, is that they may lie dormant in the host for a long period and then rather suddenly begin to multiply actively and to induce malignant growth. In other cases the virus seems to disappear from the cells after malignancy has developed. It may be that it has become so intimately incorporated into the organization of the host that it has lost its identity as an alien body.

Some viruses are highly specific. The virus of mumps attacks only man and a few species of monkeys. The virus of influenze is less discriminating. It will infect many species as widely distinct as man, monkey, swine, mouse, guineapig, and hedgehog. Cancer viruses appear to be highly specific in respect to the species they will invade and the type of tumors that they will induce. Specificity in the relation between virus and host indicates that the genetic constitution of the host determines whether a virus will invade and multiply. Since, however, viruses also show specificity for particular tissues of a single host one must assume that cytoplasmic and genic factors are both involved.

The reader will have noted the similarities in nature and in behavior of genes, plasmagenes and viruses. Viruses are conventionally distinguished by the criterion that they invade the cell from without. The question may well be asked—though it cannot be answered—where did they come from originally? One prominent geneticist has suggested that viruses are plasmagenes in the wrong host. Remembering the capacity of viruses to undergo mutation one need only conceive a plasmagene acquiring the ability to survive after detachment from the cell in which it originated and the ability to invade another cell of similar type to reduce the virus to the status of a special type of cell particulate. From what has been said of the ability of genes, plasmagenes and viruses to compete and interact with one another in the struggle for nucleoprotein it is not difficult to conceive of heritable mutations occurring in host cells as a result of invasion by a virus.

A series of experiments that is being watched with great interest at the present time is concerned with the transmission of leukemia in a sensitive strain of mice. The results suggest that the malignancy is induced by an agent that is transmitted from generation to generation by the embryo. Such an agent can scarcely be classed as an invasive agent since it passes directly from mother to young presumably as a normal component of the cytoplasm. Should these results be confirmed they will represent a contribution to the problem of cancer at least as significant as was the discovery of the milk factor.

THE HORMONES

The genetic factors, be they genes or plasmagenes, that determine the susceptibility of a cell to cancer are intrinsic to the cell itself. The tumor-inducing viruses, on the other hand, if they are true viruses, are agents that invade the cell from without. Reference has already been made to other environmental

factors that are cancerogenic in action. These include certain types of radiations and a variety of chemical substances such as arsenic components of coal tar, products of the dye industry, and a variety of synthetic hydrocarbons. The hydrocarbons are of particular interest since a number of them bear some chemical resemblance to a group of hydrocarbon derivatives that are actually produced in the human body and circulate in the blood. These are the steroid hormones. They are manufactured by the sex glands or by the cortex of the adrenal gland.

In comparison with the complex proteins which have been the subjects of discussion up to this point, the steroids are simple chemical substances. They can be prepared in the pure state, their reactions and molecular structures are known and many of them can be synthesized in the laboratory. From the chemical point of view the steroids are closely related to one another, yet, they have very different physiological activities. Only one of them—the female sex hormone, known as estrone—has been shown to have significant cancerogenic potency. A number of others, however, have been found to exert profound effects on both normal and malignant growths in organs other than those in which they are produced. Thus, although they are growth factors indigenous to the organism, they are extrinsic to the cells whose growth they control.

The sex of an animal is primarily determined by the chromosomes carried by its cells. The extent to which its sexual potentialities are realized and become functional is, however, determined to a considerable degree by the hormones secreted by its sex glands. This is well illustrated by the familiar effects of castrating an animal before puberty. Not only is there a stunting of the sex organs but there is also failure to develop those secondary characters which are typical of the sex to which the animal genetically belongs. On the other hand, overproduction of sex hormones leads to precocious puberty and to an accentuation of sex characters. Moreover, the administration to an animal of one sex of the hormone of the opposite sex results in a partial reversal of the secondary sex characters. These and a great body of related observations lead to the conclusions that the male and female hormones are essentially antagonistic in their physiological actions.

The male sex hormone, testosterone, is secreted by the testes. It shares its masculinizing properties with a number of other steroids that are usually considered together and called androgens. The ovary of the female secretes several steroids. These, together with others which exhibit feminizing actions are known as estrogens. It is a matter of common knowledge that both estrogens and androgens are secreted by animals of either sex. In the female the estrogens predominate, in the male the androgens are in excess. It is customary, therefore, to speak of the estrogen-androgen balance of an individual and to infer that it is this balance that determines the extent to which the innate sexual potentialities of the individual are realized.

The effects of the sex hormones on normal growth are highly specific. The estrogens stimulate the growth of the female genitalia, the uterus, the mammary glands, and bone. The androgens promote the growth of the male genitalia and the prostate and affect the distribution of the growth of hair on the face and body. During the past 40 years a great deal of information has accumulated to show that both types of hormones influence the tumors of certain organs and that, in general, the effects of androgens and of estrogens are antagonistic. Estrone will induce tumors in the breast, ovary, uterus, pituitary, and tests of susceptible mice. It will even lead to breast cancers in male mice of strains that carry the milk factor although these mice do not develop tumors unless estrogen is administered. Estrogens also increase the susceptibility of animals to other cancerogenic agents including radiations.

Androgens do not appear to be actively cancerogenic but they do definitely influence the growth of existing tumors of certain types. In particular they stimulate tumors of the prostate and cause regressions of breast cancers. Conversely, estrogens inhibit prostate cancers and stimulate many tumors of the breast.

The steroids of the adrenal gland have not, as yet, been shown to have any pronounced effects either on normal or on malignant growth. When the remarkable physiological effects of cortisone were first publicized it was natural to hope that this product of the adrenal cortex would prove to have some value in the control of cancer. The results of many trials on all manner of human cancers have been disappointing. The hormone does cause short-lived regressions in leukemia and so may prove to be a useful palliative in this condition but nothing more.

Quite recently much interest has been evoked in reports of favorable results of the surgical removal of both adrenal glands in patients with prostatic and some other cancers. The treatment is now being tried out by many surgeons so that its long-term efficacy should soon be ready for judicious appraisal. Why the removal of the adrenal secretion should inhibit malignant growths is a matter for speculation. There is evidence that the adrenal cortex manufactures androgens and it may be that the lack of these contributes to the regression of cancers of the prostate. The adrenal cortex, however, secretes a number of steroids each of which seems to have different but, as yet, poorly defined effects on metabolism. It is possible that the value of the operation does not depend on a simple readjustment of the estrogen-androgen balance so much as on some deep-seated change in steroid metabolism or in the general metabolism of the body cells.

In this brief recital of the more striking effects of steroids on normal and malignant growth several points merit emphasis. In the first place, it will be noted that the effects of the sex hormones are confined to tumors of those organs whose normal functions are under their control. Secondly, when a tumor is influenced both by estrogens and by androgens the effects are generally antagonistic. This is consistent with the view that cancer is often associated with an estrogen-androgen imbalance. Further evidence for this may be found in the fact that the incidence of cancers of the organs that are under the control of the sex glands is definitely increased at the menopause when there are known to be major readjustments in the secretion of the sex hormones. On the other hand, it may be that the problem is oversimplified by restricting consideration to the balance of the steroids that are the normal secretions of the sex glands. Steroids undergo many changes in the body. More than 50 different steroids have been identified in normal urine. Were some defect in metabolism to occur that resulted in the production of a steroid that was actively cancerogenic, a plausible explanation of the causes of some types of cancer would be available. In view of the high cancerogenic potencies of some synthetic hydrocarbons and the fact that estrone itself is mildly cancerogenic this view cannot be dismissed as an implausible hypothesis. It is one that is inspiring many investigators to undertake systematic studies on steroid metabolism. The work is difficult. The steroids are unstable substances. The amounts which are present in the body are exasperatingly small so that the isolation and identification of individual substances present formidable technical difficulties.

In this area metabolism, as in so many others, tracer techniques are being exploited to great advantage, and knowledge of the reactions which enter into the synthesis and metabolism of steroids in the body is accumulating rapidly. Some evidence that there are abnormalities in steroid metabolism in patients with cancer has already been disclosed. The significance of the results is uncertain. One must, perforce, hasten slowly in their interpretation. There is always the difficulty of deciding whether an observed abnormality is a cause or is merely an incidental result of the diseased state that one is studying. However this may be, investigations of the metabolism of steroids are of the first importance to the problem of cancer and will continue to occupy a prominent place in the research program of the Cancer Society.

This review of the relation of hormones to cancer has been confined to the steroid hormones because the effects of some of these on certain types of tumors is experimentally demonstrable and, therefore, inescapable. There are, however, many other hormones in the body that cannot be ignored in any comprehensive survey of the intrinsic chemical factors that control growth processes. They are entirely different in nature from the steroids being related chemically to the proteins. All of them in some manner or other influence metabolism. A few of them, notably the growth hormone of the pituitary gland, has pronounced effects upon the growth of the body as a whole. Their relations to malignant growth are obscure but are not to be ignored because they are indirect.

Beyond the immediate effects of individual hormones on growth, is the problem of the control of the secretions of the endocrine glands by the organism as a whole. This is the central problem of endocrinology at the present time. A fascinating story is unfolding of the interplay of individual glands, of cooperating hormones and of antagonistic hormones, of a complex system of mutual self-controls. There emerges a pattern of a closely knit interlocking directorate that controls the overall hormone balance of the organisms and, therefore, the balance of metabolism.

There are still wider ramifications that the future must explore. The balanced growth of the different organs of the body and the regenerative processes that

occur in injured tissues, these must be under some type of control by chemical agents having hormonelike qualities. The whole question of the reason why cells derived from a single fertilized ovum develop differently to become nerve, muscle, bone, or blood cells and so on is one that suggests that specific chemical inciters are involved. The nature of these hypothetical agents is unknown. These are fields in which a concentration of effort is urgently to be desired. Our understanding of the dedifferentiation and the aggressive growth of malignant cells waits upon the elucidation of the chemical factors that control normal differentiation and the orderly growth of healthy organs.

THE CHEMOTHERAPY OF CANCER

Until the turn of the century laboratory research on cancer was essentially morphological. That is to say, it was preoccupied with detailed examinations of the anatomical structures, both macroscopic and microscopic, of all sorts and varieties of tumors. Knowledge of the functional aspects of the growth of cancers was meager depending, as it did, on the accumulation of such desultory observations on human subjects as alert clinicians were able to make. No experimental study of the growth of malignant cells was possible until actively growing tumors could be brought into the laboratory and studied under controlled conditions.

In the first two decades of the century 3 dramatic developments followed one another in rapid succession and laid the groundwork for an experimental science of cancer. The first of these was the demonstration that spontaneous cancers in laboratory animals could be transmitted to other animals of the same species by the implantation of a few of the cancerous cells. The tumors that developed retained the essential characteristics of the original cancer and could, in their turn, be used to infect other animals. In this way the supply of a given type of tumor could be maintained indefinitely. Somewhat later it was shown that cancers could be produced in the laboratory by simple chemical means. All that was necessary was the repeated application of coal tar to the skin of animals. The third development was the introduction of the technique of tissue culture. This was immediately applied to cancerous tissues and it was shown that cancer cells could be grown in test tubes and would retain their malignant characters indefinitely.

Within a few years these new techniques had been developed and refined to such a degree that a wide variety of standard animal tumors became available for such studies as biochemists, geneticists, virologists, and endocrinologists might be inspired to undertake. The stage was also set for a systematic approach to the chemotherapy of cancer. It became possible to compare the growth-inhibiting potencies of an indefinite number of drugs on a variety of animal tumors and so to seek out those classes of compounds that showed promise of having therapeutic value. In this way the arduous and exacting business of testing drugs on human cancers could be limited to those compounds that survived the screening process in animals.

Although, technically, the stage was set some 20 years ago for an intensive chemotherapeutic program, the guiding ideas and the impetus to develop it were lacking. Only sporadic studies by a few enthusiasts developed. The objective of such a program was clear. It was to seek out substances that would destroy cancer cells without doing irreparable damage to the normal tissues of the host.

What was lacking was some guiding principles as to where to look for these materials and a sustained faith that they could be found. The lack of faith seemed to be justified by the indifferent success of chemotherapy in the broad field of infectious diseases. If it was proving so difficult to find drugs that would discriminate between cells as utterly different genetically as bacteria and the cells of the human body, what hope was there of finding agents that would leave normal cells unharmed while they sought out and destroyed the cancerous progeny of these cells? It was recognized that tumors occasionally did regress spontaneously and so were presumably subject to some indigenous inhibitors of growth. On the other hand, so much emphasis was placed on the principle that malignant growths were autonomous that there was little encouragement to attempt to control them pharmacologically.

The discovery of the sulfa drugs, followed swiftly by the discovery of the antibiotics, changed the whole climate of opinion. It became evident that the world of bacteria could be brought under control. There remained the world of the viruses and beyond that the realm of the malignant cell. The task was still recognized to be a formidable one, but it was no longer to be rejected as

hopeless. The chemotherapy of cancer began to take form. It received impetus from the fact that our understanding of the chemistry of growth, of the nutritional requirements of the cell, and of the role of the vitamins in growth, had developed to the point that ways of controlling growth by chemical agents were beginning to suggest themselves. The most significant suggestion actually came from the study of the mode of action of the growth-inhibiting properties of the sulfa-drugs. It was found that these drugs were interfering with the utilization by the bacteria of a vitamin (para-aminobenzoic acid) that was essential for their growth. Because the sulfa-compounds were related in chemical structure to the vitamin it was postulated that they entered into competition with it and blocked its utilization by the cell. The drugs behaved like fraudulent vitamins, deceiving the cell to the extent of being incorporated into the metabolic machinery in place of the true vitamin. Since, however, they were imperfect substitutes, they were unable to carry out the metabolic functions of the vitamin. The gears of metabolism became locked, growth was arrested and the cell died.

This hypothesis has come to be known as the antimetabolite theory of the action of drugs. It has proved to be a very profitable one in explaining the action of many substances foreign to the body. It has provided chemotherapy with its most useful guiding principle, namely, that if one wishes to find a drug that will inhibit a specific metabolic reaction one should look for it amongst the chemical analogues of the metabolites that normally enter into the reaction. This is exactly the kind of principle that the synthetic organic chemist needs as he attempts to keep the biologist supplied with new compounds worthy of chemotherapeutic evaluation.

It is probable that research on the chemotherapy of cancer would have gotten well underway in the early forties had it not been delayed by the outbreak of the war. Paradoxically, the first dramatic success, the first breach in the chemical defenses of the cancer cell, came as a byproduct of wartime research. One of the early symptoms of exposure to nitrogen mustard gas was found to be a fall in the count of white cells in the blood. Since normal white cells were destroyed it was natural to hope that the overproduction of malignant white cells that is characteristic of leukemia might be brought under control by the same agent. The experiment was tried and was a success. Hundreds of related compounds were promptly prepared and tested on animals but, curiously enough, the original war gas was found to be about as effective as any. It came into use therapeutically and proved to be a helpful palliative in some cancers of the blood-forming organs. More recently a distantly related compound, triethylene melamine, has come into favor.

It is interesting to note that the two discoveries that gave to the chemotherapy of cancer the impetus which has been so evident since the end of the war arose from investigations unrelated to cancer. The antimetabolite theory had its origin in studies of the nutritional requirements of micro-organisms. The therapeutic potentialities of mustard gas were disclosed in the course of research in chemical warfare.

It has been the recurrent theme of this report, that, because cancer cells multiply more rapidly than do most normal cells, they may be more vulnerable to nuclear damage. The manner in which the nitrogen mustards exert their lethal action supports this thesis since there is good evidence that their primary effect is on the nucleus of the cell. They probably interfere with the metabolism of nucleic acid. Indeed, they are one of the few classes of compounds that increase the rates of genetic mutations in cells to about the same degree as do X-rays.

In line with current thought, contemporary programs directed toward the chemotherapeutic control of cancer are now sharply focused on the nucleus of the cell. To begin with, drugs such as colchicine, podophyllin and urethane, that were known to inhibit cell division were screened on animal tumors. In general, the results were disappointing. The differences between the doses toxic to the animal and the doses that inhibited tumor growth were too small to encourage therapeutic use. Only urethane has received any measure of clinical acceptance. It is stated to be helpful in the control of multiple myeloma, a condition that has not responded to other cancerolytic agents.

Reaching out beyond the known drugs, extensive synthetic programs were developed to produce compounds that might be antimetabolites in the synthesis of nucleic acid. These have been of two main types. One type comprises a great variety of analogs of the two major constituents of nucleic acid, the purines and the pyrimidines. A few of these, such as 8-azaguanine and 2,6

diaminopurine have attracted particular attention and have received clinical trials. The second class of compounds are those which have come to be known as antifolics. This is because they are related to and competitively inhibit the vitamin called folic acid. When these compounds first attracted attention the relation of folic acid to growth was obscure. Recently, however, it has been shown that this vitamin is essential for the synthesis of nucleic acid and so the antifolics are to be regarded as inhibitors of nucleic acid metabolism. Several of these compounds, notably Aminopterin and A-methopterin have received favorable publicity. Their therapeutic value, however, is limited to cancers of the blood-forming organs and is only temporary. At doses tolerable to the host they do not damage the cancer sufficiently to prevent recurrence following removal of the drug. It is claimed that they are particularly useful in the control of acute lukemia in children where remissions are obtained in about 50 percent of cases and a second remission may often be induced before the cells become refractory to the drug.

It must be acknowledged that the attack on the nucleus of the cell has, as yet, resulted only in minor successes. The therapeutic value in man of the antinucleic acid agents has been confined to cancers of the blood-forming organs. Several important lessons have, however, been learned and will guide further studies. In the first place each type of tumor in animals shows its own range of sensitivities to a series of drugs. Moreover, the same type of tumor in different species may show differences in relative sensitivities. This means that each type of tumor in man represents a separate chemotherapeutic problem. It is unlikely that a single miracle drug will be found which will control the major types of cancer that afflict mankind.

This individuality in response that is shown by different kinds of cancers greatly complicates the problem of screening compounds since there is no clear relation between the responses of animal tumors and the therapeutic effectiveness in man. If human cancers could be transplanted to animals a more reliable screening of compounds might be possible. Unfortunately when the transplants are made in the usual ways they do not survive. Recent work using novel methods of transplantation give promise of developing procedures whereby actively growing human tumors may be cultivated in animals.

A second lesson that has been learned has been the dismaying ease with which tumors develop resistance to a particular drug. In this respect they are imitating the well-known adaptability of bacteria and other simple forms of life to toxic agents. It is probable that the cells in a single tumor vary widely in sensitivity to a given drug. A dose that will cause a notable regression in the size of the tumor does not kill all of the cells. The hardy ones survive and a new tumor develops populated by resistant cells with the result that a second dose of the compound is less effective. The ideal treatment would be one which killed every cell in the cancer. This would require a very much higher dose which would probably seriously injure the host if it did not kill him. This is an inevitable limitation to the antimetabolite method of attack if the metabolic process which one seeks to block is essential to the growth of normal cells as well as to that of malignant cells. One is attempting to discriminate on the basis of a quantitative rather than a qualitative difference in sensitivity. It is to be expected that the sensitivity of some normal cells will actually be greater than that of the most resistant of the cells of the cancer. In this situation the dose that will kill all of the malignant cells must destroy some normal cells.

One escape from this dilemma which has been suggested is the use of combined therapies. A priori, it is reasonable to assume that the cells that are abnormally resistant to one drug will not be the same cells as those that are abnormally resistant to a second drug that has a different mode of action. The simultaneous use of the two drugs should, then, result in more damage to the cancer at less hazard to the host. An alternative approach would be to seek out some qualitative difference between normal and malignant cells. If a metabolic reaction can be found which is essential to the growth of cancer cells but is not essential to normal cells it should be possible to block this reaction completely with an antimetabolite without interfering with the metabolism of the cells of the host. The remarkable efficacy of the antibiotics may well depend on the fact that they inhibit reactions which are essential to bacteria but not to human cells. There are a few hints that qualitative as well as quantitative differences in the metabolism of normal and of malignant cells do exist but their nature is not yet clearly enough defined to be ready for chemotherapeutic exploitation. Progress along these lines waits upon fuller knowledge of the detailed pathways of metabolism.

It is a matter of definition whether biological materials should be classified as chemotherapeutic agents. In the case of the steroid hormones it seems quite appropriate to do so inasmuch as a number of synthetic steroids, such as stilbesterol and methyl testosterone, have therapeutic activities similar to the hormones of the sex glands. Some reference has already been made to the inhibiting effects of these substances on human cancers. The present status of hormone therapy may be summarized in the statement that it is largely confined to the control of tumors of the breast and of the prostate and that hormones have their greatest value when the diseases are beyond the control of the surgeon or the radiologist. In cancer of the breast in patients well beyond the menopause, estrogens have been effective in inducing regressions of the primary tumor and of its metastases to viscera, skin and lymph nodes. Prior to the menopause, on the other hand, androgens have sometimes been useful palliatives. Castration is often effective in cancer af the male breast. Castration also leads to regression of tumors of the prostate and of many of their metastases. Beneficial results are only temporary, relapse occurring after a year or so. Estrogens alone or coupled with castration have also been used in the control of cancer of the prostate.

An interesting aspect of hormone therapy is its flexibility. One may treat the patient either by depleting the body of its normal supply of hormone by the removal of the gland that secretes it or one may augment the patient's own secretory activity by the administration of additional hormone. Further than this, one may exploit the antagonism between the male and the female hormones by the administration of estrogens to males and of androgens to females.

Although it would be improper to classify a virus as a chemotherapeutic agent it is appropriate to conclude this review with a brief reference to the use of viruses to destroy cancers. Starting with the knowledge that viruses are highly specific with respect to the types of cells that they will attack, a search was begun for viruses that spontaneously showed or could be trained to develop an affinity for tumor cells. The virus that has shown the most ineresting results is one that was isolated from an epidemic of encephalitis in Siberia in 1939. This virus normally attacks the brain and is lethal to man. When it was screened on animals carrying different kinds of tumors it was found that the virus entered and multiplied in the cells of some of the tumors and destroyed them. It was highly selective in respect to the types of tumors that it would attack. By continuous passage of the virus from tumor to tumor in animals it has been possible to enhance its tumor-destroying ability. Unfortunately it has not been possible to reduce its affinity for nervous tissue. Other viruses that are not lethal to man are now under investigation. When one recalls the diversity and the mutability of viruses it is evident that a wide and fascinating field of investigation is being opened up. Proverbially it is good tactics to set a thief to catch a thief. It may yet prove to be sound therapy to set one aggressive growth to destroy another.

THE END OF THE BEGINNING

The review of current trends in cancer research to which the preceding pages have been devoted is necessarily superficial and incomplete. Many aspects of laboratory and clinical research have been ignored. In particular, there has been no attempt to describe the steady progress that continues to be made in the care of the cancer patient. Improved methods of diagnosis, refinements in surgery, the increasing range and power of radiotherapy, the better control of the use of anaesthetics, of transfusions and of antibiotics, the increasing concern for the physical and psychological rehabilitation of the cancer patient—all these are combining to raise the cure rates of one or another type of cancer by 1 to 2 percent a year. The cumulative effect is not to be ignored. Whatever revolutionary advances in the control of cancer may or may not develop in the next few years this kind of slow relentless progress will continue. It reflects the steady onward march of medical knowledge as a whole.

In his excellent book, Science versus Cancer, Dr. I. Berenblum has summarized his view of the current status of cancer research in the words delivered by Winston Churchill at a critical stage of the last war:

"Now this is not the end. It is not even the beginning of the end. But, it is, perhaps, the end of the beginning."

The quotation is apt. It accents the main argument of this review that the problem of cancer is beginning to take definitive shape. The ground has been cleared, there is a common understanding of objectives between a diversity of

scientific disciplines, the foundations for a comprehensive experimental attack on the causes and cure of cancer have been well laid, work is being pressed at an increasing tempo.

In the pages that follow there will be found some detail of the research and training programs that have been the responsibility of the committee on growth. Brief synopses are given of the nature of the individual research projects that are now in operation. The reader may find them bewildering in their diversity and forbidding in their brevity of description. He should, however, find in them some reflection of the major trends in cancer research that have been discussed above. One point of first importance bears emphasis. The ideas behind the individual projects, the ideas that gave them birth, did not come from the committee on growth. They came from the investigators who are conducting the projects. That is to say the research program of the committee is not a program conceived by a group of 20 advisers in executive session, it is the program of a congress of several hundred operating scientists.

In some respects it may be said that the policy of the committee on growth is one of laissez-faire. It is not, however, a random policy simply because the progress of science is not random. It has a strong sense of direction, intuitive but compelling. It is held to its course as though by an automatic pilot. By some mysterious telepathy, the thoughts of independent investigators mold each others emerging ideas and there develops a consensus of opinion that is the real architect of the pattern of research at any time. No committee, however wise, can substitute for this consensus. No wise committee would attempt to do so.

Dr. CAMERON. Dr. Heller has pointed out that this is not one disease. It is tremendously important to understand how many diseases we are actually talking about when we use the word "cancer."

One of the great students of cancer not so long ago, Dr. James Ewing, used to say that in terms of their behavior and their structure, there were more kinds of cancer than there were of other diseases combined. There is the type of cancer which is similar to cancer of the breast, cancer of the rectum, and cancer of the lip, and these bear no relation to one another in terms of cause, in how they begin, in how they are treated, and how they respond to treatment.

If we take one kind of cancer, cancer of the breast, we still have an enormously complicated problem, because there is not 1 kind of cancer of the breast, but there are 6 or 8 general kinds, but if you were talking about 1 kind of cancer of the breast, what the physician calls adenocarcinoma, you still have a complicated problem facing you, because there are many kinds. They are roughly classified as four grades according to the rate at which they grow. Grade 1 does not behave like grade 4 and a patient with grade 1 follows no pattern that is comparable to the patient with grade 4 of the same type of cancer of the same organ.

Now, it is that inherent complexity of cancer which is responsible for the complexity on the whole which Dr. Heller has referred to. There is complexity of public education, complexity in diagnosing it, the complexity that faces the doctor who is trying to arrive at a reasonable validation of his suspicion of cancer and the complexity of treatment. Perhaps most important to us all here today is the complexity which this inherent field of cancer imposes upon research.

Fifty years ago the annual death rate from cancer in the United States was 64 per 100,000 of population. The estimated death rate for the current year is in the order of 145 per 100,000.

Mr. Chairman, if it would be consistent with my discussion of this problem I would like to suggest that you open the document which is before you called Cancer in the United States and turn to page 14, because it will hasten my presentation if I can refer to the charts which appear in that document serially.

I have referred to the increase in cancer, and there is, as you pointed out, an increase in heart disease, but this is at the expense of decreases in most other diseases—diseases which were at the turn of the century the leading causes of death.

In 1900 tuberculosis was called the great white plague and it was a leading cause of death. Today it is eighth in the list of causes of death.

So recently as my own medical school days, pneumonia was called captain of the men of death, and it took the life of 1 in every 3 which it struck. Today as a result of the sulfa drugs and antibiotics, pneumonia has a mortality rate of less than 8 percent.

Typhoid fever, which swept across the country and decimated whole populations in rural areas, is now a disgrace to any community and a single case of typhoid fever—a single case of smallpox—is enough to send an entire city's population to be vaccinated within a space of 10 days.

The life expectancy for men as a result of these accomplishments of medicine in the control of infectious, contagious, nutritional diseases, is close to 68 years, and that for women has already passed the scriptural threescore and 10.

The aggregate result is, as you will see on chart 2, that there are about 3 times as many people in the United States over the age of 45 as there were at the turn of the century.

The next chart indicates that cancer is a disease of those 45 and beyond, and since there is this unprecedented increase in the older segment of our population, it is perhaps not too unreasonable that we should have as many as 3 times the number of deaths from cancer as we had 50 years ago. Whereas, for the present year the estimated deaths attributable to cancer will come to well over 200,000—about 224,000—the deaths which may be anticipated at the present rate of increase according to chart 4, will reach a figure of 415,000 in a short space of 47 years.

Now the late increase in cancer—recorded incidence and mortality—is due, to a degree which we cannot determine, to more accurate diagnosis which is more generally available today than ever before. Improved standards of medical care, by reducing death from infectious diseases and by diagnosing cancer with greater precision, serve to increase the reported amount of cancer in the population.

I will call your attention to chart 5 which indicates that mortality from infectious and parasitic diseases appears to vary based on the number of doctors in a population. The more doctors there are, the fewer the deaths from infectious diseases, but with respect to cancer we are faced with the unhappy paradox as shown in chart 6 that the more doctors there are in the community, the higher the cancer death rate is, which could lead and sometimes does to the theory that if you have cancer the doctor is the last person whom you should see. What we are sure of, though, is that it means in communities with high standards of medical care one's chances of dying from cancer are substantially less than they are in other areas. High living standards, high literacy rates, good nutrition, high quality, and generally available medical care, reduce these deaths from infectious, contagious, and nutritional diseases and that leaves little to die from except cancer and heart disease.

While these two factors—lengthening of life and wider recognition of cancer—account for the bulk of cancer's mounting incidence and mortality and for the recorded increase in cancer, they do not appear to do so for every kind of cancer. Indeed, at least one form of cancer, namely, cancer of the lung, is increasing at an alarming rate, and it has been called by some observers an epidemic of cancer and suggests the operation of cancer-producing factors of relatively recent development.

Now, at the turn of the century, cancer, as has been pointed out, was eighth in the list of causes of death. It was preceded by Bright's disease, tuberculosis, pneumonia, diarrhea, enteritis, and diseases of the muscular system; 78,000 people a year were dying from it. What research was being carried on was in terms more of alchemy than science.

There was but one specifically designated cancer hospital in this country and there were no cancer clinics at all. There was no support from the Federal Government of programs of research or control and only one State recognized its responsibility in this respect. No word of cancer appeared in the media of public information. Nowhere was cancer a reportable disease. The biopsy was still a subject of controversy among doctors—that is, the taking of a piece of tissue to study it under the microscope to be sure it was cancer, was still a matter of medical controversy. X-rays were being employed somewhat gingerly and radium cost five times its present price, thereby limiting its availability sharply.

The operation for cancer of the rectum, now performed in every crossroads hospital, was an innovation, and tumors of the central nervous system, of the lung, of the pancreas, and of the esophagus were not yet surgical diseases.

Today, cancer is second among the causes of death, now striking 1 in every 5 of our population and being the cause of 1 in every 7 deaths. The countrywide budget for cancer research in the United States is in the order of $15 million annually. The American College of Surgeons approves 11 cancer hospitals, 539 cancer clinics and 113 cancer diagnostic clinics. There are about 240 cancer detection centers, the primary objective of which is to uncover unsuspected cancer in presumably well persons. This year's appropriation by the Federal Government for cancer research and cancer control is $20,237,000, and the voluntary health agency, the American Cancer Society, has this year received $19,500,000 in contributions from the public. Cancer information is given wide attention in newspapers, magazines, on the radio, and television. X-rays are being generated at higher and higher voltages and targeted with increasing precision, while radium or its new substitute, radioactive cobalt, are available widely throughout the country. Surgery has boldly extended its frontiers so that there is virtually no part of the body now sacred from the scalpel.

This recital, I hope, serves to underscore the point that virtually everything we know today about cancer—virtually everything we know that is utile in treating it and diagnosing it—we have learned in a single generation. And, yet, we must all agree that we are still in the green years of medical discovery, and nothing certainly will be adduced here today or no evidence presented which would justify a position of apathy or resignation, with respect to future progress in this disease.

I want to close my remarks concerning the extent of this problem, by referring to the curability of cancer today since Dr. Heller has, I think, so effectively discussed the economic aspect of it. There is no other disease which presents such a disparity of curability under varying conditions of early diagnosis and expert treatment.

I want to say a word about localized disease. One of the features of cancer is that sooner or later it spreads from its point of origin and goes to other parts of the body. This is partly due to the biological features of the tumor, but is also partly due to the factor of time. Therefore, the interval between the onset of the signs and symptoms and the time treatment is given, is of utmost importance in the control of this disease today, assuming, of course, the availability of expert treatment.

Chart 8 shows what this disparity is. Cancer of the breast, treated under the best circumstances today while the disease is confined to the breast, can be cured 7 or 8 times out of 10. Of all cases with breast cancer in the United States, we are not curing more than one-third. Cancer of the neck of the womb—the leading cause of death from cancer among women—is now curable 7 times out of 10 when it is treated while the disease is confined to the cervix; we are not curing more than 20 percent of cancer of the cervix in this country. Cancer of the mouth is curable in two-thirds of the cases when it is treated while the tumors are no bigger than my little fingernail. Countrywide, we are not curing more than one-third of our oral cancer. Now, this disparity is identifiable for almost every form of cancer and it is the basis for the program of education and control, which I trust will be elucidated in more detail as the days go on.

In aggregate, what I have said means according to chart 9 that it is possible today to cure one-half of all cancer. We are actually curing only one-half of that half. The remaining one-half of patients who develop cancer must look to the advances yet to come from research enterprises now under way.

One final word—it is information supplied to me actually by Dr. Heller and his staff—and it concerns the economic impact of this disease. The officers of the National Cancer Institute have calculated that on the basis of the number of patients destined to get cancer this year, there will be admitted to hospitals in the United States in the course of this single year 114,530 patients who will stay in the hospital an average of 27 days. According to my multiplication this means 11,921,310 patient-days in the United States in a single year attributable to cancer. If the cost in a hospital can be average at $15 a day—and that is conservative—I am sure some of my esteemed friends here will say, this means that we are paying $178,819,000 a year for treating cancer, and we are losing at the rate of 3 to 1. Thank you.

Dr. HELLER. Mr. Chairman, it is no accident that the men around this table know each other, because they work together and have learned to work as a team.

We have, I hope, established the point that cancer is an extraordinarily complicated, complex disease, well recognizing that there has been an understanding, in fact an urgency in our minds that it is necessary that all the resources available in this great Nation be mobilized on as integrated a basis as possible, compatible with our democratic way of doing things in medicine and in other endeavors.

I should like to establish with the committee the point that there is a liaison of understanding in knowledge and exchange of information—intelligence if you please—in this cancer control and cancer research effort.

I have requested Mr. Runyon of the American Cancer Society to speak on that point. Mr. Runyon is executive vice president of that society.

The CHAIRMAN. Before we proceed, would it be possible and would you be willing, Doctor, for members of the committee who desire to be given the opportunity to ask such questions as they may desire?

Dr. HELLER. Definitely, Mr. Chairman.

The CHAIRMAN. In that connection, I would like it also to be recognized by those who are present about the table, who have been introduced to us, that you may ask each other questions if you wish, in order to make more plain or to emphasize any point that you wish. In other words, this is a symposium that is being held with you people who are here as recognized representatives of these organizations and the committee is privileged to take part in it. Are there any questions which the members of the committee desire to ask at this time?

Doctor, I would like to ask the question as to what is the situation with respect to the number of beds available to care for cancer victims?

Dr. CAMERON. I think the answer to that is a difficult one to arrive at, if the question is predicated on the basis that cancer beds are specifically designated as such. If you were to hold to that basis for the question, I should estimate that we could probably count not more than 1,800 beds in this country. But, every bed in every hospital designated as a general hospital is available to patients with cancer. They are received just as are patients with heart disease or with acute appendicitis.

So, the number of beds available for cancer patients is not a specific problem disassociated from the major problem of the availability of hospital beds and facilities.

The CHAIRMAN. You used the figure 1,800. I presume you have in mind particular hospitals that are so designated?

Dr. CAMERON. Precisely.

The CHAIRMAN. Those are beds solely and entirely for cancer treatment?

Dr. CAMERON. Yes, sir.

The CHAIRMAN. I notice on chart 7 some very interesting figures relating to death rates and causes of cancer by countries—selected countries. There seems to be a very pronounced difference in the cancer rate in different countries. What is that due to, in your opinion?

Dr. CAMERON. It is due not to any difference in susceptibility to cancer, we believe, but to two factors: One, the standard of medical care, by which I mean the accuracy of reporting cancer; and No. 2, the age of the population.

Not very long ago someone got excited over the fact that there was very little cancer on the island of Ceylon. The death rate from cancer on Ceylon—which I think is not in this list—is 11 per 100,000, the lowest in the world. But there are very few people in Ceylon who live beyond the age of 35; they die from the diseases we have been talking about today as having been controlled in this country,

or from similar ones. So they do not live long enough to get cancer. The operation of those two factors accounts for most of the disparity in the incidence or mortality from cancer.

Let me say one more word; this chart which you have referred to divides the countries of the world according to their general death rates. The countries with a general death rate from all causes greater than 1,500 per 100,000 of population are in the right-hand column, and those with general death rates of less than 1,500 per 100,000 are in the left-hand column. You will note in the column where the death rates are high, there are relatively low rates from cancer, whereas in the countries where people grow old—where the total death rates are lower—there are the highest recorded death rates from cancer.

The CHAIRMAN. Well, having in mind the explanation that you have just made, how would you account for the difference between El Salvador and Costa Rica?

I am asking you the question more from the standpoint of trying to ascertain what is the underlying cause. Those two countries are very close to one another and have the same general characteristics. I have been in both of those countries, but it would be hard to express my opinion as to wherein they differ, and yet I notice that the rate for El Salvador is 1,747.4, and the cancer rate is 12.9, while in Costa Rica the cancer rate is 62.8. In other words, five times as much almost as its neighbor, El Salvador. Yet the total rate of death is approximately the same, 1,708.7 against 1,747.4 in El Salvador.

Dr. CAMERON. These death rates from cancer are notoriously unreliable, and all this chart does is to express a trend. I could not explain it perhaps as well as you can since I have not been to either country. Actually the difference between the two would be of doubtful statistical significance. When we get a range from 43 and 146, then we have something that we can talk about with reasonable assurance.

Actually I have only one possible explanation, sir, and it is a very limp one. Is not Costa Rica closer to the United States?

The CHAIRMAN. If it is I would not know it personally based on the time it takes to fly from El Salvador to Costa Rica.

Dr. CAMERON. No, sir.

Mr. WILLIAMS. El Salvador is north of there.

The CHAIRMAN. That is what I thought. El Salvador is north of Costa Rica. Costa Rica is immediately next to Panama.

Dr. CAMERON. Well, my explanation is limper than ever.

The CHAIRMAN. Sir?

Dr. CAMERON. My explanation is limper than ever.

Mr. DOLLIVER. Might it be explainable on the basis of the accuracy of diagnosis or the post mortem examination as to the cause of death?

Dr. CAMERON. That well could be. As I pointed out, that is one of the factors which appear to explain these differences. I am not sufficiently familiar with the difference in diagnostic facilities in the countries we are talking about to be able to assign it to that specifically.

The CHAIRMAN. Well, there was that difference which was so striking that I thought there might be some significance there.

I am inclined to think that there may be a lot to what you say with reference to the accuracy of the figures, because when you go into one of those countries you are impressed that that could be very readily

an explanation. When we come to a country such as Switzerland that is considered to be progressive from the standpoint of advancement in medical science, or Sweden, in the latter, the cancer rate is 136.2 and the total rate is 1,088. In the United States the cancer rate is 120 as against the total rate of 1,074. No; I was using Norway figures at that point instead of Sweden, but the Swedish figures are practically the same.

I was wondering if that difference in the cancer rate between 120 and 136 in Norway and 135 in Sweden would be due to what Mr. Dolliver has said? Is there any difference in the diagnosis or treatment of it—public or private—in the United States as compared to Norway or Sweden?

Dr. CAMERON. I would be inclined to answer that one by the other factor which I mentioned and which would be applicable for the year 1940 on which, or around which, most of these figures are based and we are here talking about record keeping and recording the causes of death and correlating this information. This has been done with much greater effectiveness and for a longer period by these two Scandinavian countries than we have been able to do in the registration area of the United States. We think we have about caught up with them now.

The CHAIRMAN. Well, of course, I asked the question not from the standpoint of any sense of obligation or responsibility to these other countries but in the effort to ascertain whether there are any different methods pursued there that would enable them to get better returns than we do here.

We were speaking a moment ago about the number of beds. What would you say is the major problem of availability of beds in general hospitals?

Dr. CAMERON. I would say the major problem is the disposition of those beds. Is that an intelligent answer to your question?

The CHAIRMAN. Well, partially so; that does touch on a very important element, if you have in mind by disposition the same thing that I do. Do you have in mind the disposition so far as the locality is concerned?

Dr. CAMERON. Partly. I also have in mind disposition so far as ability to pay for hospital services is concerned.

The CHAIRMAN. That subject will be one that this committee will give considerable attention to as these hearings draw toward a close.

It is very apparent with respect to hospitalization and general medical care that the very poor are able to get attention and the very rich, but today the great number of people that lie between the poor and the rich are up against a pretty stiff proposition when it comes to cancer, for instance.

I have an illustration of that in my own family that I know of and in that instance I know it has been difficult to carry on under the circumstances.

That will be given attention by this committee, but this question that I asked was with reference—not that you are a specialist in that any more than any other doctor, whether it be heart or rheumatism or whaever it might be—to what in the general picture it is that you would consider is the real problem or the major problem of providing availability of beds in general hospitals.

Dr. CAMERON. I do not think I could amplify my answer.

The CHAIRMAN. This committee has recognized that problem to the extent that we passed legislation that provides for a construction program of hospitals among the several States, based upon a certain formula, and it was adopted with the idea of providing additional hospitals to communities that seemed to be unable to have them under the present construction cost.

If any other members of the committee have any questions, I wish you would take advantage of this opportunity to ask them.

Would you answer this question: Is there more cancer now than there was 40 or 50 years ago?

Dr. CAMERON. Yes, sir.

The CHAIRMAN. What is that due to? A better knowledge of what is cancer or a better keeping of statistics, or is the growth of the disease greater?

Dr. CAMERON. I think it is due to the three factors I pointed out.

No. 1, it is due to the fact we have more old people and cancer is mainly a disease of older people, so we stand to have more cancer. No. 2, it is due to more accurate diagnosis and better record keeping, and No. 3, it is due to an indeterminate degree to an increase in cancer itself.

Mr. DOLLIVER. The chairman has asked some questions with respect to the number of beds available for the treatment of cancer. As I understood you, you said there were about 1,800 beds devoted exclusively to cancer, but the number available for cancer was limited only by the incidence of the disease and the local availability of hospital space.

Is it the confirmed opinion of the medical profession that cancer is not a communicable disease or what is the status of the learning of the profession on that particular phase of the problem?

Dr. CAMERON. I think the widely held view is that human cancer is not communicable.

Mr. DOLLIVER. Does the medical profession generally believe that the disease is hereditary in any aspect?

Dr. CAMERON. There are evidences of certain hereditary relationships for certain kinds of cancer.

Mr. DOLLIVER. Could you specify those? I do not mean to get into any technical details if that is not proper, but I think it would be informative perhaps to the committee and to the public generally.

Dr. CAMERON. Cancer of the breast, cancer of the intestine—let us say cancer of the digestive system—and probably cancer of the female generative organs appear to occur slightly more frequently in familial lines than would be accountable for on a pure random basis.

I wish other members of this panel would amplify that if it needs it, or correct it.

Dr. HELLER. Mr. Chairman and Mr. Dolliver, there is a report in the literature apropos of breast cancer incidence which states that women whose mothers had cancer of the breast are 3 to 5 times more likely to acquire cancer of the breast than do women whose maternal ancestry did not have the disease. That has been reported in literature from reputable sources, but it has not been completely documented or supported in detail as to that exact increase, but it does suggest, as Dr. Cameron pointed out, that the tendency is toward familial hereditary traits to be involved in cancer.

Mr. DOLLIVER. Has a study been made with reference to the familial characteristics with reference to the incidence of cancer as a dominant or special characteristic in the line of descent?

Dr. HELLER. Mr. Dolliver, to answer your question directly, studies of extensive nature have been made in animals, but studies in human beings have not been possible because the human race is essentially not one of inbred people except in extraordinary situations.

I wonder if I might call upon Dr. Mider and ask if he would care to illuminate us on that subject.

Dr. Mider, have you any comments?

Dr. MIDER. The experience has already been recounted to you by Dr. Cameron and Dr. Heller with reference to mammary cancer and we are in accord on the facts. It is interesting that some trace of familial influence has been observed in the Scandinavian countries and Great Britain, and a recently published study from the United States—a very brief study from New York—indicates that in a high proportion of mothers and daughters who both develop cancer of the breast, the daughter develops it at a considerably younger age than does the mother.

It has long been known that there are some familial instances of cancer in human experience, and in a very few instances families have been recorded in which the specific type of cancer has appeared in successive generations.

I would reemphasize that this is a truly exceptional phenomenon, and was studied extensively by the late Dr. Whorton, of the University of Michigan. Many physicians have within their own experience observed what they choose to call cancer families in which an apparently inordinate proportion of the family has acquired or died of cancer.

Mr. DOLLIVER. Both male and female?

Dr. MIDER. Both male and female. These instances of cancer, however, have not been of any one or even a very few specific anatomical types. They have been more or less at random and have not necessarily affected successive generations.

When we go to the laboratory and use the laboratory mice and breed them together, brother and sister, in successive generations, we are able to develop strains of mice in which a specific anatomical type of cancer is readily predictable. Furthermore, it is possible to tell at about what age these standardized animals will develop their tumors. It seems, therefore, that there is from laboratory investigation strong evidence of hereditary factors playing an important role in the development of cancer. But, to obtain similar evidence by a similar type of study in man seems now impossible because of moral and ethical questions.

The CHAIRMAN. Are there any further questions, gentlemen?

May I ask just what is cancer? Can you give us some kind of a definition? What is it? We talk about it as if it was the most familiar thing in the world. What is cancer?

Dr. HELLER. Mr. Chairman, the proposition of what is cancer from an abstract scientific viewpoint is one of the most difficult things in the world. Cancer is a situation in which the cell loses its ability to grow in a normal manner. In other words, there is a removal—if I may be permitted this latitude—there is a removal of the inhibiting factor which makes a cell or a group of cells stop growing after they

form a toenail or a nose or a finger. Someone has described it as cells gone crazy or cells gone berserk. That is an oversimplification scientifically, and I think perhaps some of my colleagues could supply a more precise definition.

I wonder if Dr. Rhoads would care to comment on that?

Dr. RHOADS. I think one must oversimplify to make clear the biological problem which we term cancer. If one chooses to oversimplify one must recall that the body is composed of a number of individual tiny units or cells. Each one of these units has the power to reproduce itself. Each one of these units is in a constant state of repairing and renewing, growing old, and dying. So, large biological units, such as our bodies, are simply a composite of an enormous number of individual tiny units that we call cells.

We have felt it proper to use the example of grass and weeds. We believe that the cancer cell can be compared to the growth of weeds in a lawn of grass, the cancer cell being more aggressive and more competent under the particular environmental circumstances in which it finds itself than are the normal cells. You see in cancer as a process in the body under the microscope what you have seen many times when weeds have invaded your lawn.

The tendency of biological units of any type, whether they be bacteria or body cells, is not only to reproduce themselves exactly, but also to inherit characteristics indicated by what we call sport or mutation and confer upon the progeny aggressive types of competence not possessed by the brothers and sisters or by the parents. They continue to grow uncontrolled and destroy bodily structures.

The CHAIRMAN. What causes this abnormal growth that is frequently spoken of as sometimes resulting from a blow? If that is the case all of these prizefighters ought to be dead with cancer or dying fast, according to the blows they get. Does that have anything to do with it, injuries?

Dr. RHOADS. It is very hard to escape the conclusion, though still very difficult to document in court, that injury can play a role in the development of cancer, providing the tissue injured is already inclined to be cancerous.

The CHAIRMAN. I assumed when I asked the question that, of course, if you could answer that you would have the cure for it.

Dr. RHOADS. No, sir; that does not necessarily follow unless we could not only define the cause, but also remove or neutralize this cause.

The CHAIRMAN. I think finding the cause, you might be able to conquer it in the way you have just explained here.

Dr. RHOADS. Yes, sir; we would be very happy indeed, and we do now know a number of causes of cancer. Cancer can be caused in men and animals by X-rays or the rays from radium, and as you know that is one of our great fears in the case of atomic attack and indeed there is evidence that the incidence of certain forms of cancer has increased in Japan following the injury from the bomb, still very slight evidence, but quite suggestive.

We can cause cancer in man and animals by certain chemicals which have been prepared by the chemist in his laboratory and tested. We do have in our bodies chemicals that cause cancer in experimental animals. There is also the hazard resulting from X-rays and certain chemicals encountered in industry.

The CHAIRMAN. Does the question of diet have any effect on cancer?

Dr. RHOADS. There is unequivocal evidence that restriction of caloric intake and dietary restriction in experimental animals will reduce the rate of occurrence of the cancer to which these animals are liable spontaneously and will reduce the tendency of these animals to acquire cancer after exposure to sunlight, X-rays, and cancer-producing chemicals. The lessened functioning of the glands of internal secretion which follows this dietary restriction is presumed to lead to the result of reducing the incidence of cancer.

The CHAIRMAN. Does the American Cancer Society or any other agency that is interested in the question of cancer indicate the kind of a diet that would be helpful in preventing cancer or making it less likely, or that would promote it?

Dr. RHOADS. May I refer this back to the Director of the National Cancer Institute?

Dr. HELLER. I am not sure that that could be answered to your satisfaction because it has not been established scientifically, to my knowledge. I wonder if Dr. Mider has any elucidation on that.

Dr. MIDER. This is a very complex problem.

The work that Dr. Rhoads referred to involved the quantitative restriction of an adequate diet. The animals were given less diet than they would have chosen had they had the choice. A dietary essential was restricted, and it resulted in a marked decrease in the number of cancers of the breast that followed.

There is cancer of the liver which can be readily produced with a particular dye, but this dye produces cancer only when the diet is restricted in a very important vitamin. If animals can eat all they want to, if they eat a highly nutritious diet they develop comparatively little cancer of the liver. If, however, the riboflavin content is reduced they develop a lot.

It is interesting, however, that studies of certain segments of the human population purport to show that cancer occurs more frequently among those who are considered to be overweight.

The CHAIRMAN. I hope that does not apply to any of the committee.

Is there a tendency for cancer to be more pronounced in some countries than others, having in mind the different diets that are used in different countries?

Dr. MIDER. I am afraid, Mr. Chairman, that I cannot answer that categorically, although I believe some members of this panel might submit suggestions.

Cancer of the liver occurs more commonly in Africa than in the United States, which might have something to do with dietary considerations.

The CHAIRMAN. Have you found in your studies, or experiments, that animals, dogs, mice, or whatever it is that you wish to use as an illustration, develop cancer without it having been inoculated into them? In other words, is there a natural cancerous growth in any animals that you know of, that is, either domestic or wild animals?

Dr. MIDER. Yes, sir; almost all of the animals that have been studied have some incidence of cancer, including those which are wild, when they are incarcerated in captivity. It is a problem which is not limited to man or even to mammalia. The loss to chicken breeders from various forms of cancer is not inconsiderable.

The CHAIRMAN. I was wondering whether that condition arises naturally.

Dr. MIDER. To the best of my knowledge, sir, it does through so-called spontaneous tumors.

Dr. HELLER. Mr. Chairman, many studies have been made of great interest relating to the natural occurrence of cancer in fish or on trees. The so-called knars or galls on trees are considered to be the equivalent of cancers and there are also cancers in certain animals.

There is a very serious livestock problem in the southwestern part of the United States which has been occupying the attention of veterinarians and cancer experts as well, so that there is a natural occurrence of cancer in practically all animals and in many plants. There is sometimes almost a predictable incidence if you use enough of them. Taking 100,000 trees we would find the next 100,000 would have perhaps a similar incidence. It varies in different climates and under different conditions.

The CHAIRMAN. That is very interesting. All of this indicates to me the extreme necessity of having as comprehensive a research program as it is possible to carry on.

Now, may I ask one further question. Having in mind the question that was introduced by Mr. Dolliver, using cancer of the breast as an illustration, would that affect a child who was breast fed?

Dr. HELLER. Dr. Mider, can you answer that?

Dr. MIDER. That is a very difficult question, Mr. Chairman. Do you want me to restrict my answer to the human population?

The CHAIRMAN. To what?

Dr. MIDER. To the human population?

The CHAIRMAN. I will not restrict you in any sense. If you can give us an answer I would appreciate it. I did not intentionally try to find a hard one. It just came to my mind, that is all.

Dr. MIDER. There appears to be a substance that occurs in mice which can be transmitted in the milk of mothers to their suckling infants which strongly influences the likelihood of the development of cancer of the breast. It would now appear that, while this material is very important, mice can develop cancer of the breast in the absence of the so-called milk factor which was originally described by Dr. Bittner.

We have no conclusive evidence to suggest that comparable material can be demonstrated in human mothers. The rabbit, which also develops considerable frequency of breast cancer, has so far failed to reveal any evidence of a comparable influence.

The CHAIRMAN. Mr. Dolliver.

Mr. DOLLIVER. I do not know whether these terms that I am about to use are recognized medical terms or not. If they are not, please correct them.

I have heard the terms used, "benign" and "malignant," which is a growth which is not benign, but is violent, so to speak. I would be glad if we could have the relationship between those two kinds of growth explained by some of the panel, if there is any connection between them or if they are two separate kinds of growths and difficulties.

Dr. HELLER. Mr. Dolliver, tumors are not, necessarily cancers. What you refer to is the so-called benign tumor as contrasted or opposed to a malignant tumor.

Mr. DOLIVER. That is right.

Dr. HELLER. Tumors do occur which are benign as contrasted with malignant, and why there should be that difference is not known.

In many instances they are similar in some of their characteristics. The so-called benign tumor does not expand by simple mechanical pressure or disease the organs or interfere with the functions of the body, nor does it metastasize, that is, spread through the body which, as Dr. Cameron has pointed out, is one of the characteristics of the so-called malignant tumors. There are other pathological differences, of course, but that is an explanation which is as simple as I can make it.

Mr. DOLLIVER. Are there clinical, scientific means of distinguishing between benign and malignant tumors?

Dr. HELLER. Yes, sir.

Mr. DOLLIVER. They are certain and without any doubt as to the nature of the tumors?

Dr. HELLER. Well, I would not say it as unequivocally as that, Mr. Dolliver. The best way for the determination as to whether it is benign or malignant is by a procedure called biopsy—taking a slice of tissue and looking at it under the microscope—and detecting the presence of certain cells which are characteristic or changes in cells which are characteristic of cancer which are discernible to the trained pathologist and indicate whether cancer is present or not. I can say that there are a certain number of tumors on which there is a difference of opinion on the part of experts in the field. It may be 5 10, or 15 percent or even one-half who say that it is malignant and others that it is not, and there, of course, is one of the fields in medicine in which the sense of the majority usually rules as to whether it is malignant or not.

I wonder if some of my pathologist friends on the panel like Dr. Farber would care to carry that explanation further.

Dr. FARBER. Mr. Dolliver, in answer to your question, a malignant tumor is one that has the capacity for causing death or that will cause death unless removed early enough and completely enough before it has spread to the other parts of the body. Of course, a tumor may cause death if it is so situated as to put pressure upon a very vital area. For example, a very slowly growing tumor which does not have the capacity to spread to other parts of the body, situated on the brain may, nevertheless, cause death if not removed.

So, the term "benign" must be defined in terms of the whole picture and finally in terms of what it does to the human body as well. The differentiation between the two, as Dr. Heller pointed out, is very well defined. There is a group of people in the country in the medical profession known as pathologists who are highly skilled in differentiating the nature of a tumor from the study of a small piece of tissue which is removed by the surgeon at the operation, usually before the entire operation is performed. For example, when there is a malignant tumor present we have a diagnosis made by a pathologist while the patient is still under the anesthetic before very much of the operative procedure has been carried out. In a case of cancer of the breast the diagnosis is made by the pathologist from a piece of tissue which is given to him by the surgeon before the breast is removed, and the condition of the tissue is then determined and is the basis of the report of the pathologist.

The CHAIRMAN. Along the line that you have just answered Mr. Dolliver, how many men in the United States are capable of making an accurate biopsy?

Dr. FARBER. Mr. Chairman, I would say that here are hundreds or probably a few thousand men who are trained in this country in such a way as to permit them to make a perfectly accurate diagnosis from biopsy of a tumor.

The CHAIRMAN. I notice in this chart No. 4 entitled, "Forecast of Cancer Deaths" that at the present we have an annual rate of 211,000. I notice that by the year 2000 it is going to reach 415,000 deaths per year.

Is that estimate projected on the basis of increased population or is it based upon that factor together with the number that have already died in the past?

Dr. CAMERON. It is based on both, Mr. Wolverton.

It is based on the esitmated increase in total population, and it is based on the estimated lengthening of the life span. You will note that the curve begins to level off at about the year 2000, and that is because at that time it is anticipated that the age of our population will begin to stabilize.

The CHAIRMAN. Well, of course, I do not see how, in view of what is known at the moment, it could be estimated that there will be no improvement between the present, 1953, and the year 2000 in the detection of the disease and the treatment of it.

Dr. CAMERON. No, that is why we say, "If present rates continue."

The CHAIRMAN. Oh, I notice that. I did not notice that before. That is a very significant thing, "If present rates continue." We are trying to get that "if" out of our system by our hearings here today and by what we hope will develop as a result of them.

Could you give any figures as to the cost of cancer illness to the Nation or to communities or to families? I am personally aware of the great cost that can come to a family where this disease strikes an individual.

Is there any estimate of what the average cost is of caring for a patient? There may be different classifications of patients, but is there any information that you can give us along the line of cost? We are intensely interested in this question of cost because it is so apparent that at the present cost of medical attention and hospitalization is a real difficult situation that is faced by the average family. When I say "the average family," I mean a family that is not poor and a family that is not rich—the average family.

Dr. CAMERON. First, Mr. Chairman, let me say before passing that to the Director of the Institute, that I think there are some figures on that, at least I know that they have addressed attention to this paricular matter. It is difficult to arrive at a meaningful figure for the reason that cancer of the lip, for instance, requires no hospitalization and can be treated virtually in one sitting successfully, resulting in no loss of earning power. It is very different from cancer of the rectum, which is removed, and which requires from 6 to 8 weeks convalescence, after which there may be a return to a modified type of employment and then followed in a year or two by further evidence of it and a gradual increase of invalidism and death. That is one of the complexities that grows out of the inherent complexity of cancer. I do

not see how an average figure would be meaningful, but if there is one I am sure that Dr. Heller has it.

Dr. HELLER. Mr. Chairman, I do not have a figure which I believe would be meaningful to the committee. With your permission I should like to have the privilege of inserting it in the record.

(The matter referred to follows:)

COST OF MEDICAL CARE TO CANCER PATIENTS

(Prepared by National Cancer Institute, October 4, 1953)

Only a few attempts have been made to study the costs of medical care to individual cancer patients. Agencies interested in this subject have found it difficult to locate suitable areas for such studies and to enlist the full support and cooperation of hospital associations and medical societies concerned, an essential requirement for the successful collection of data. One of the obstacles is that hospitals do not routinely tabulate or maintain information on admissions, discharges, or hospital stay according to diagnosis. The only recent study on hospital costs for cancer patients, which can be located, is the one conducted by the American Cancer Society for the Vermont State Cancer Commission in 1947.[1]

Good data are available on length of hospital stay for cancer patients, which, when coupled with the results of the Vermont survey, can yield acceptable approximations for hospital costs. The recent morbidity surveys of the National Cancer Institute in 10 urban areas[2] indicated that 3 out of every 4 diagnosed cases of cancer receive hospital care. Further, the average total length of hospital stay (first admission and readmissions) for hospitalized cancer patients can be expected to amount to 32 days. While hospital per diem costs have risen rapidly in recent years and vary considerably in different regions of the country and by size of hospital, a typical cost figure for room and board would be close to $10 a day. According to the Vermont study, the per diem charges accounted for three-fifths of the total amount billed by hospitals.

Assuming that this relationship still holds, a per diem rate of $10 means an average cost per hospital day of $16 to $17 to the cancer patient. Using these results, the estimated average total cost of hospitalization to the patient hospitalized turns out to be $535. On the basis of the schedule of fees for surgery and supporting services contained in typical Blue Shield plans, an individual from a family of low or moderate income can be expected to pay at least an additional $350 for physicians' services (diagnosis, surgery, radiation, and followup care). Individuals normally earning higher incomes would pay considerably more. Thus, the average cancer patient hospitalized (3 out of every 4 cases diagnosed) can expect to pay at least $885 for diagnosis and treatment. These estimates are minimal because they do not take account of the cost of care subsequent to hospital discharge (stay in nursing and convalescent homes and medical care in the patient's home).

The cost of medical care to cancer patients not requiring hospitalization or discovered too late to warrant treatment (1 out of every 4 cases diagnosed), can be fixed at $100, at least. Again, this figure does not include the cost of nursing or convalescent home care. For all cancer patients, whether hospitalized or not, the cost of diagnosis and treatment would average at least $700 per patient.

Many families are confronted with higher-than-average hospital bills. In this connection certain other data from the Vermont study are of interest. They suggest that the top 10 percent of the hospital bills would be for amounts in excess of twice the average hospital bill. One of 10 cancer patients hospitalized at present can be expected to run up hospital bills of more than $1,070.

Patients and their families are confronted with these bills at a time when income is drastically reduced, either through loss of income by the wage earner or through the necessity of hiring housekeeping help. It is not surprising that according to the Vermont experience, slightly more than one-fifth of the patients were unable to make any payment from their own resources toward their hospital bill. More than one-fourth of the patients required some charitable aid

[1] Daniel F. Horn, Report of Cancer Survey. Vermont State Cancer Commission, Biennial Report, 1946–48.

[2] Cancer Illness in Ten Urban Areas in the United States, National Cancer Institute, Cancer Morbidity Series, 1950–52.

in the payment of their bills. Two-thirds were able to pay their bills in full from their own resources.

VOLUNTARY INSURANCE PROTECTION IN CANCER CASES

At the end of 1952, about 91 million persons in the United States were insured against the costs of all or part of their hospital care, 73 million against all or part of their surgical bills, and 36 million against other medical bills, principally for cases cared for in the hospital. With the exception of approximately 5 million persons enrolled in several other types of programs, the entire coverage was under Blue Cross, medical society, and insurance company contracts. Most of the voluntary health-insurance programs existing in the United States today, however, were developed to provide protection mainly against short-term hospitalized illnesses. They were not intended to cover chronic or long-term cases, and many of their provisions make them of limited value in cancer cases.

Provisions of insurance company group contracts for hospitalization.[3]—The usual payments for hospital care range from $4 to $7 per day for 31 days for any one hospitalization period, with usually no limit to the number of days that benefits are payable during the year if each hospitalization is for a different illness. Payments also are made for additional hospital charges usually based upon the daily benefit and ranging from 5 to 31 times the daily amount. There is no restriction as to the type of additional service except that coverage is not granted for doctors' fees or nurses' room or board.

The plans exclude hospitalization for industrial injuries or diseases for which the employee is entitled to benefits under workmen's compensation laws, hospitalization for military service-connected disabilities, and for plastic operations for cosmetic or beautifying purposes.

Provisions of group insurance contracts for medical and surgical expense.—Almost all group contracts for medical and surgical expense provide reimbursement for surgical expense only. The insured employee is reimbursed for the surgical fee up to the amount listed in the Schedule of Operations for the operation performed, but not more than the actual fee charged by the doctor. Typical schedules are the $150 maximum plan and the $250 maximum plan. The policies also specify a maximum amount that will be paid during any one continuous period of disability, should more than one operation be required. This amount ranges from $150 to $300.

Among the few contracts offering reimbursement for medical nonsurgical expense, the majority are limited to reimbursement of costs of physicians' visits while the employee is in the hospital or to in-hospital benefits. Payments to employees are usually up to $3 for a hospital or home visit and $2 for an office visit, but not exceeding 50 visits per year. The first 2 or 3 visits in an illness are generally excluded, but the first treatment in an accident case is included.

Medical expense insurance written by insurance companies generally excludes occupational injuries or illnesses that entitle the insured to benefits under workmen's compensation or occupational disease laws. It also excludes plastic surgical operations for cosmetic or beautifying purposes, if the condition existed at the time the policy was written. The coverage in the policies written by the large insurance companies is otherwise usually all-inclusive, even covering chronic conditions, alcoholism, a heart condition, and nervous breakdowns.

Blue Cross and Blue Shield plans.[4]—The benefit provisions of Blue Cross and Blue Shield plans vary widely from plan to plan. Some plans specify the number of days of hospital service or indemnity, usually varying from 21 to 150 days for each condition requiring hospitalization. Other plans provide benefits usually 21 or 30 days plus 50 percent or a specified dollar amount per day for an additional 30, 60, or as high as 180 days in a few plans. Some plans pay a maximum of 21 days the first year and increase it to 30 or 31 days in the second or third year of membership with the number of days of care remaining the same thereafter.

Some Blue Cross plans limit the number of days for the year but the current trend is to allow a maximum number of days for each illness instead of each year. Originally, almost all plans excluded care for preexisting conditions,

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[3] Editorial staff of Prentice Hall, Inc.: Successful Employee Benefit Plans. New York, Prentice Hall, Inc., 1952, pp. 49–53; 60–63.

[4] Editorial staff of Prentice Hall, Inc.: Successful Employee Benefit Plans. New York, Prentice Hall, Inc., 1952, pp. 54–59; 66–69; Voluntary Prepayment Medical Care Plans, 1953, Council on Medicine Service, American Medical Association; Blue Cross Guide, 1953, Blue Cross Commission.

mental disease, tuberculosis, guarantinable diseases, venereal diseases, alcoholism, drug addiction, self-inflicted injuries, and congenital defects. Now, with few exceptions, plans have abandoned one or more of these restrictions. Most plans will not provide care for the sole purpose of obtaining a diagnosis, and all deny service for cases in which care is available through workmen's compensation or governmental facilities.

When a subscriber changes his job, he may continue his membership by making payment direct to the plan at a slight increase in rate, or he may transfer to an existing Blue Cross group at his new place of employment with no lapse of coverage. If the subscriber moves to another community he may enroll in the Blue Cross plan there without a waiting period. He may continue his membership after retirement and after he reaches the age of 65, although he cannot enroll after the age of 65, except in large Blue Cross groups where the age limit is waived.

In Blue Shield medical-society plans the amount of protection depends on family income. There is usually no income limit for enrollment purposes, but if the income exceeds a specified amount, the benefits are applied as a credit to the total charges made by the physician. The usual annual income limits are $2,500 for a single subscriber and $4,000 for a family. Participating physicians agree not to charge patients whose income is below these amounts a fee higher than that specified in the contract.

Most Blue Shield medical-society plans exclude plastic or cosmetic surgery for a condition existing at the time of enrollment; alcoholic or drug addiction; congenital anomalies; drugs, appliances, and eyeglasses; functional disorders of the mind or nervous system; rest cures; preexisting conditions during the first 11 months of enrollment, unless waived in the group contract because of a large percentage enrollment.

A recent study indicates that slightly more than a fourth of the civilian noninstitutional population aged 65 and over had some hospitalization insurance in March 1952. Proportionately more men than women had insurance. Proportionately the white population had nearly three times as many with insurance as the nonwhite. Insurance held by those 65 and over was heavily concentrated in the age group 65–69 and was most common among urban residents and persons in the labor force especially in nonagricultural employment.[5]

Major or excess medical expense contracts.[6]—This type of insurance, usually referred to as "catastrophic," was first offered for sale about 2 years ago by a few of the insurance companies. Such policies would be of more benefit to patients with cancer and other long-term cases than the older type contracts of Blue Cross and Blue Shield and insurance-company group coverage.

This type of insurance is designed to meet the costs that normally exceed the protection of the usual group-insurance plan. It is anticipated that the usual group hospital and medical-care plans will pay the deductible amount, or the employee can pay that amount without undue financial strain.

The insurance company pays 75 percent of the medical expense for any one illness, in excess of the deductible amount, up to the maximum stated in the policy, usually $2,000 to $5,000. Each new illness or injury is entitled to its own maximum. Medical expense is defined as any expense incurred by the insured for the diagnosis, treatment, or care of a nonoccupational, accidental bodily injury, or disease. This includes physicians', surgeons', and nurses' fees, hospital and clinic charges, X-ray examinations and treatments, laboratory tests, anesthesia, drugs and medicines, and all other therapeutic services and supplies.

The coverage under this type of insurance is very broad. Only accidents and illnesses covered by workmen's-compensation insurance are excluded. Preexisting conditions are covered, provided the employee is at work when the policy is written. Even psychiatric treatment is covered, and also dentistry, if directed by the insured's physician.

This type of insurance is usually written for employees with annual earnings of $5,000 or more. At the end of 1952 about 700,000 persons were protected by insurance of this type.

An example of this type of insurance is the General Motors' plan for salaried employees earning $5,000 or more a year and for their dependents. After deduction of the amounts paid or the services provided under its basic Blue Cross-Blue

[5] Falk, I. S., and Brewster, Agnes W., Hospital Insurance for the Aged, Social Security Bulletin, November 1952.

[6] Editorial staff of Prentice Hall, Inc.: Successful Employee Benefit Plans. New York, Prentice Hall, Inc., 1952, pp. 63–66.

Shield hospital and surgical expense program, an additional amount is deducted from the total expenses depending upon the income of the employee—$100 for employees with salaries up to $12,000 a year, with a graded additional deductible amount up to $300 for those earning more. After the deductions are made, the supplementary plan pays 80 percent of the remaining expenses up to $10,000 incurred during a single medical expense period by an employee and up to $5,000 incurred for a dependent.[7]

The interest of organized medicine in obtaining more protection for cancer patients through voluntary health insurance was indicated recently. Dr. Louis H. Bauer, president of the American Medical Association, issued a year-end statement setting forth the association's 1953 program which included as one of the association's 9 objectives for 1953 the extension of voluntary health insurance not only to cover more people but also to embrace those over 65 years of age and those suffering from illness of long duration.[8]

The CHAIRMAN. I realize it is not an easy figure to advance. We are seeking all of the information that it would be possible for you to give us on that question of cost.

In concluding my questioning I was impressed with the statement that was made by Dr. Farber in which he said that there were maybe 2,000 in this Nation who were capable of making an accurate biopsy.

Two thousand is a large number from some standpoints, but as you look at this Nation as a whole and its great expanse, 2,000 in that particular classification does not seem to me to be a very great number to meet the problem that we have facing us in cancer.

Dr. FARBER. May I answer that point? I am very glad that you give me another opportunity to continue the remarks that I should have continued a while ago. I cannot give you the exact number of pathologists. I can give you the exact numbers certified by the American Board of Pathology as having had sufficient training, who passed the examinations, the number given to me who are permitted to call themselves certified pathologists. No matter how large the number is, it is certainly far from enough to meet the needs of the surgeons of the country who require the help of the pathologists at the time of an operation. May I make that point?

The CHAIRMAN. Yes; I am glad you emphasize that. That is what struck me, and that was the purpose in asking the question, so that you could emphasize the point you have just made.

Are there any further questions?

Mr. WILLIAMS. Mr. Chairman.

The CHAIRMAN. Mr. Williams.

Mr. WILLIAMS. To what extent is the X-ray used as a means of detecting cancer, or are there practical means of detecting cancer through X-rays, blood tests, and other similar tests which could be carried out on a universal basis?

Dr. CAMERON. There are cancers which occur in various parts of the body, some of which are not exhibited by this type of procedure, but the presence of cancer in many sites can be determined with high accuracy by X-ray examination.

In the case of malignant tumors of the bone this is a relatively simple procedure, because the bone density differs from the surrounding tissues. However, when you are trying to determine the presence of a tumor arising in the stomach, in which the density of the tumor does not differ from the density of the surrounding structures, it is necessary to apply different techniques. In brief, diagnosis of

[7] Major Medical Expense Plans Are Adopted by Three Large Firms—Employee Benefit Plan Review, fall, 1952.

[8] New York Times, January 2, 1953.

stomach cancer requires us to exercise knowledge of the digestive system. As another example by injecting air into certain potential spaces in the brain it is possible to identify with reasonable accuracy certain tumors of the brain and spinal cord.

I cannot give you a figure on it without some further study, but I would say that X-rays are certainly one of the most valuable means we have in arriving at a diagnosis of cancer.

Dr. Farber has pointed out that final diagnosis is determined by a laboratory study, by a biopsy.

Mr. WILLIAMS. Chest X-rays have been made over a period of the last 5 or 6 years by these mobile units which go around to different parts of the country. When this drive was put on I believe that was a tuberculosis drive, if I am not mistaken, but I was wondering if cancer has been detected in cases like that to any extent.

Dr. CAMERON. Yes; in this procedure you certainly discover cancers of the lung, which certainly cannot be found by any other screening device. In the studies which have been made the tuberculosis patients have been generally younger. The age group that we are concerned with in cancer patients is somewhat older. I think the tuberculosis people would agree with that statement. We feel, for instance, that X-rays of the chest in men over the age of 45 will result in earlier diagnosis of lung cancer, and that is very important.

Mr. WILLIAMS. That might be an opportunity for the Government to assist in cancer detection through these mobile units. Do you think such a program would be worthwhile?

Dr. CAMERON. I think that as a program of mass screening, the X-raying of large numbers of men for cancer of the lung is entirely feasible, and I feel that it is necessary if we are to achieve any substantial measure of control over this form of the disease.

Mr. WILLIAMS. Would not the same thing be true of blood tests?

Dr. CAMERON. No; there are no practical blood tests for cancer. There is helpful information which can be obtained from blood tests and from other body secretions in specific forms of cancer, but they are not applicable as screening methods.

For example, a particular substance which works in the blood, known as acid phosphatase, is found in the blood in increased quantities in patients with cancer of the prostate. This is one of a series of diagnostic procedures employed in the absence of more definitive information, and I think cannot be considered a blood test.

Mr. WILLIAMS. At the moment, cancer control, as I understand it, depends primarily on early detection; does it not?

Dr. CAMERON. At the present moment?

Mr. WILLIAMS. Yes.

Dr. CAMERON. I think that is fair; yes, sir.

Mr. WILLIAMS. Do you know anything that the Government might be able to do to assist in bringing about earlier detection of these cases throughout the country, any kind of a program that might be instituted along those lines?

Dr. CAMERSON. Yes, I do; and I think it is being done.

Now, the degree to which it is being done is, perhaps, something which would involve us here for a long time. My feeling is that the mechanism for discovering the kind of effective case-finding activities which you point out that are so badly needed exist now. I think that there is opportunity for very fertile discussion as to the extent

to which they can be augmented and made to turn at a faster rate.

If you were asking for my thought I would say again that I would like to consider that further and I would like to talk with our colleagues about it because it is obviously an enormously important direction to take.

The CHAIRMAN. Having in mind what Mr. Williams has just brought out, and your answer that early detection is very helpful in the treatment of the disease, would not a system of clinics of a large character be helpful in getting those results?

Dr. CAMERON. That has been considered, and I mentioned the fact that there are about 240 detection centers in the country.

The CHAIRMAN. That does not seem many to me for 48 States.

Dr. CAMERON. No; but you see what they have done. I ask you to turn to a chart which will summarize our experience in there. It is chart No. 16.

We have studied the results of the examinations for cancer in about 90 of these detection centers, and we found that the rate of cancer was about 8 per 1,000 patients examined. They are presumably well people. You see that in the younger people very little cancer was found. The rate is of practical interest in people from 50 to 59, and over the age of 60 the number of cases found is of real interest in regard to control measures. It suggests, among other things, that we might concentrate the search for cancer in those age groups in which it is profitable to look for it.

The CHAIRMAN. I had particularly in mind, Doctor, general clinics. Would not they be helpful in the case of cancer as well as heart and all of the other diseases that mankind experiences? I have in mind, even in these X-ray-detection centers that you speak of, that very frequently they examine a man maybe for cancer, and it may not be detected, but maybe some other deficiency may be found. That would be a helpful thing which would be taken advantage of as a Government program.

Dr. CAMERON. In this series of examinations 65 percent of the patients were found to have had noncancerous disease or other abnormality.

It depends on the degree of thoroughness of the examination. It has been said that a normal patient is one who has been incompletely studied, so I think that if you want to intensify the examination and extend its coverage you can turn up a great deal of abnormal findings, which would tend, in the aggregate, to prolong life.

The CHAIRMAN. We are all aware of these drives that are put on for the purpose of detection, for instance, of tuberculosis, heart disease, and what not. They are directed to that particular one phase that that particular organization is interested in. I have in mind what could be obtained from a general inquiry that would examine for all purposes, and in that connection I was very much inmpressed with the explanation that was made of the so-called Kaiser system in California. I do not know too much about it, and we will know before the hearing is over, I hope, but the thing that impressed me about what was being done was this general examination by which those who were members of the organization were put through general tests and any of these deficiencies that existed were expected to be brought to light. It may have been cancer, it may have been heart disease, it may have been tuberculosis, or it may have been any one of these many

diseases, but the study of the individual was made along all lines, and not just one line. I am wondering whether there is not something that might be done by a Government agency, either Federal, State, or local, that would bring about this general examination and that would make it possible for people to be advised early of the conditions that exist and thereby get a better opportunity of cure of the disease.

Dr. CAMERON. I think it is important to bring out here, Mr. Chairman, that most of these examinations which have been done in the name of cancer case finding are general and complete physical examinations. That is why they have been able to turn up these other things, but I think this must be recognized, that the idea of a routine physical examination has been advocated for many years by responsible medical organizations, and by insurance groups, and the medical association went on record as favoring this type of medical practice. There was a program instituted some years ago to give this type of examination to the policyholders of the insurance companies, but when the examination in the name of health maintenance, general health maintenance, was offered it really did not take hold.

When this examination was offered in the name of finding a way conceivably of being delivered from an alarming, fearsome disease people had stimulation, and it was cancer which made the physical examination idea take hold. Of course, it is not really universal, but it is practiced today much more widely than it ever has been. I think that the complete physical examination leaves much to be desired. Unfortunately I do not know the answer. I think it is examination; we are preparing to continue these general physical surveys in the name of cancer case finding.

There is one more point, and that is that doctors recognize their individual responsibilities now in this kind of medicine, and there has been a generally spreading sentiment on the part of the profession to incorporate this kind of prophylactic medicine within the framework of office practice. So I could not be sure to what extent a system of clinics is necessary.

The CHAIRMAN. I have in mind that when it comes to a physical examination, complete in character, it is just outside of possibility that a family can pay for a father and mother and four or five children, on the basis of the charges that are made at the present time. Of course, that in itself is a deterrent.

On the other hand, when you do it from a public standpoint it unfortunately is too true that the individual does not see the importance of it and is not willing to take advantage of it.

However, I am pursuing all lines of thought with respect to these matters and the emphasis that you have placed on early detection was what brought this to my mind to ask the questions.

Mr. CARLYLE. Mr. Chairman?

The CHAIRMAN. Mr. Carlyle.

Mr. CARLYLE. Dr. Cameron, I note on chart 17 the location of cancer clinics throughout the country. What particular service is rendered by these clinics?

Dr. CAMERON. The cancer clinics are usually operated within a hospital. They form part of the physical structure of the outpatient departments in such hospitals. These clinics are staffed by representatives of the various medical specialties serving that hospital. Characteristically they consist of the pathologist who has been mentioned

today, and who is frequently the chairman of the clinic or the clinic director; surgeons, X-ray and radium therapists and diagnosticians; and where they are available, other medical specialists such as skin specialists, gynecologists, and others. These men get together collectively to consider the problems of individual patients with cancer, because again the complexity of this disease is so great that it has been recognized that this group opinion is a very effective way to solve many of the problems. So they offer the services of diagnosis and treatment to patients with cancer.

Mr. CARLYLE. As contrasted with chart 15, where cancer-detection centers are located. You say, then, that chart 15 would indicate where the cancer center is located, where the cancer can be detected; and chart 17 represents the location of clinics where the cancer can be treated.

Dr. CAMERON. Approximately, yes; diagnosed and treated. We make a distinction between detection and diagnosis, Mr. Carlyle, because detection is looking to see if it is there and diagnosis is finding out what it is you are looking at.

The CHAIRMAN. Any further questions, gentlemen?

Mr. ROBERTS. Mr. Chairman?

The CHAIRMAN. Mr. Roberts.

Mr. ROBERTS. Doctor, in your statement you mentioned that there has been a great increase in the particular type of cancer known as lung cancer. Have any conclusions been reached by the profession as to why that is true?

Dr. CAMERON. I would say no conclusions, because the matter is still under very careful scrutiny. I will say that in the past 5 years there has been an enormous increase in the research interest directed at this problem and in the epidemiologic studies, which are making the facts clearer that there is in this increase; and the studies which are trying to identify it with one of the external environmental causes which I mentioned in my original presentation. I think there are no conclusions. I think there are growing suspicions.

Mr. ROBERTS. What age group does seem to have the greatest number of cases? In what age group is that?

Dr. CAMERON. It is certainly commonest in those from 50 to 70, but it appears slightly earlier than most cancer.

Mr. DEROUNIAN. Would the gentleman yield on that?

I seem to be a "bug" on this question of nicotine, but we have doctors back home who have sort of impressed me with this fact, and I want to know whether it is true from your standpoint: That lung cancer is on the increase and the increase has been more predominant in the women as against the men; and, as regards lung cancer 25 years ago and today, the increase has been so great in the women that there is pretty concrete proof, this fellow says, that it may be due to smoking, that women who smoke cigarettes may inhale and that is a cause of greater lung cancer, and the men have not had such an increase because a lot of men smoke pipes and cigars and they do not inhale pipes and cigars? Is there more than a suspicion from your investigation as to the truth of that statement?

Dr. CAMERON. Well, you are directing that to me? I mean, there are other people here.

Mr. DEROUNIAN. I know the cigarette manufacturers are interested in this.

The CHAIRMAN. I think maybe the reason Dr. Cameron asked if you were directing that to him is this: I think, from what I understand, that Dr. Rhoads has made a particular study of that.

Dr. HELLER. Dr. Rhoads?

Mr. DEROUNIAN. Anyone at all who wants to answer.

Dr. CAMERON. I will say this: If we are to be serious about this and spend more time on it, I think it will be necessary to correct one of your premises. I think the increase has not been predominatly in women. I think the reverse is true. At the turn of the century they used to say that there was one female cancer of the lung for every four male cancers of the lung. Today they fix the difference very much wider. The generally accepted figure is 1 female for every 8 or 9 or 10 males now.

There have been about 10 or 12 studies which have shown that the rate of heavy smoking is higher in men with cancer of the lung than it is in control groups. These control groups have been almost without exception from hospital populations. There are many defects with this type of study. I barely understand it myself, not being a statistician by training.

But I do want to say, in advance of the evidence which Dr. Rhoads may be willing to give, that we regard this as a most important fact to establish or to deny; the relationship of smoking to cancer

The American Cancer Society undertook a year and a half ago a study which now involves 210,000 males in the United States between the ages of 50 and 69. Those men are known to us. They are all on punch cards in our offices in New York. We have their smoking histories. We know how they have smoked for the past 40 years, and we have a lot who did not smoke.

The essential thing was to get men who were well between 50 and 69 and whose smoking histories we could accurately record. We have all that information. Now every time one of those men dies the fact is reported to us. We certify the cause of death with the local department of health and that is recorded on his punchcard. From here on, whenever we have a slack afternoon we run the cards through to see whether the men with heavy smoking histories are dying of cancer at a faster rate than those who do not smoke. It is going to take another year and a half to get answers with any degree of certainty, but I am sure we will have them in a way that will satisfy you.

The CHAIRMAN. If you will permit, Mr. Derounian, I would like to say that I am awfully sorry I did not know about this before I assumed the responsibility of stopping smoking. Maybe I could have been one of those 210,000 you would have checked up on, and maybe I could have been saved this task of trying to stop smoking.

Dr. CAMERON. Well, it may not be too late to include you.

The CHAIRMAN. Had you finished?

Mr. DEROUNIAN. I was just wondering whether Dr. Rhoads had anything on this point that he wishes to speak to.

Dr. RHOADS. Mr. Chairman, I think Dr. Cameron has dealt very adequately with the epidemiologic study of lung cancer and its relation to smoking. My interest is derived from the presence on my staff of Dr. Winder, who, with Dr. Graham, of St. Louis, made perhaps the first convincing statistical study which developed information strongly suggesting a relationship between the smoking of cigarettes and the occurrence of lung cancer.

The rate of occurrence is much greater in men than in women. The rate of increase is greater in men than in women. Our figures are nearer 20 to 1 than the 5 to 1 quoted by Dr. Cameron, but they vary from clinic to clinic.

There are no less than 11 publications which have confirmed the findings of Drs. Winder and Graham. So adequate is the confirmation that we have felt compelled to do what could be done to stimulate further studies of this matter.

I am a consultant to certain studies presently under way at New York University. Part of the study is at our own institution. A very serious effort is going forward to investigate the constituents present in cigarette smoke and tobacco smoke in general and in other sources of air pollution. Machines have been devised for mechanically smoking cigarettes in a manner and under physical circumstances as nearly simulating those which humans use in smoking as possible.

The tars so derived have been collected and have been shown to be productive of cancer in mice and in rabbits. We have chemists working on the problem, and these chemists have divided these tars into certain pure fractions which are presently under test in experimental animals, and certain tests have been made upon the skin of human volunteers, or at least a human volunteer, to ascertain whether there can be induced changes which would suggest that some chemical part of the cigarette tar may be implicated as one factor among several factors in the etiology, the cause of lung cancer.

In short, I am suspicious that there is a relationship. I am sure smoking is not the only factor, from the evidence. We are doing all we can do to establish the factor in smoking, if there, and to get it out of there by some mechanical filtration or chemical neutralization means. I do not believe we can stop the population from smoking.

Dr. HELLER. Mr. Chairman, a further possible elucidation of this particular problem: In collaboration with the Veterans' Administration we are starting a study of one-third of a million, approximately, veterans of World War I to ascertain their smoking habits and to obtain from the death certificates subsequently the fact as to whether or not this does represent the same high correlation which has obtained in other studies; so that studies are under way in an attempt to illuminate this particular very difficult question.

The CHAIRMAN. Off the record.

(Discussion off the record.)

The CHAIRMAN. Now, gentlemen, are there any other questions?

I do not know whether it comes within this particular phase of our inquiry, which we are now engaged in, but it came to my attention that Dr. Rhoads, who has assisted us so splendidly this morning, and who will continue to do so, has even permitted himself to be a sort of a guinea pig, if an intelligent man can be characterized that way, in permitting certain tests to be made, which he is undergoing, of one kind or another.

Is there something to that, Doctor, which would have any bearing on the question of nicotine; or are your experiences along some different lines? I understood you had submitted yourself to certain tests that are being made and observed day by day. Is that true?

Dr. RHOADS. Well, I think I really ought to invoke the fifth amendment here.

The CHAIRMAN. I beg your pardon?

Dr. RHOADS. I think I ought to invoke the fifth amendment.

The CHAIRMAN. Well, I am sure you have a better reason for it than some others.

Dr. RHOADS. I hope so. The answer, sir, is that——

The CHAIRMAN. I know it is your modesty which takes advantage of the fifth amendment.

Dr. RHOADS. Well, all through my scientific life I have taken part actively in tests of various compounds. I have not had tests made upon me which would be hazardous or which I would hesitate at all in having made upon relatives or patients, if they care to have them made. It is only a part of the day-to-day routine, sir. It is nothing of any consequence.

The CHAIRMAN. I thought the committee would be interested in knowing this fact about Dr. Rhoads, who is extremely modest in his statements with reference to it. Maybe I can elaborate more upon it when I talk to the members of the committee individually, but it certainly is pleasing to have one as a witness here today who is personally so interested in the subject on which he testifies that he is willing to go to great lengths to be helpful to the profession and to others. We admire Dr. Rhoads for that.

Mr. WILLIAMS. Mr. Chairman?

The CHAIRMAN. Mr. Williams.

Mr. WILLIAMS. I have one more question I would like to ask.

I wonder if you have conducted any studies or if you have any information on which to base a conclusion as to whether or not the incidence of cancer is greater in urban areas or in rural areas, or if there is any difference?

The reason I ask that is this: I wonder if possibly the breathing of industrial fumes and poisons, and so forth, in the cities might be a contributing factor to a higher cancer rate in the cities than in the country?

Dr. CAMERON. It is very seriously regarded. The rate of cancer of the lung is consistently higher in urban areas than in rural areas. A recent study from England has indicated that it is higher in that part of the city which is exposed to the byproducts of a nearby coke factory than it is in other parts of the city.

The subject of atmospheric pollutants is being worked on with increasing interest, and studies are presently under way to test various atmospheric fractions from smog-smitten cities such as Los Angeles in a effort to find what cancer-inciting role they may have.

Mr. ROBERTS. Mr. Chairman?

The CHAIRMAN. Mr. Roberts.

Mr. ROBERTS. I would like to know if any members of the panel have prepared any comparative figures which would show what we spend, for instance, for agricultural research, for research on animals, as compared to what we are spending for cancer research.

Dr. HELLER. Mr. Roberts, I am not sure that we have those exact data available for you. However, we shall attempt to get them and put them in the record if you desire.

Mr. ROBERTS. I would like to have those, if you can get them for me.

(The information is as follows:)

COMPARATIVE FIGURES ON CONTROL OF ONE ANIMAL DISEASE AND AGRICULTURAL RESEARCH COMPARED TO COST OF CANCER RESEARCH

According to the Albert and Mary Lasker Foundation, Inc., the United States Department of Agriculture authorized the spending of $32,701,700 for control of hoof-and-mouth disease in a single year in Mexico as compared with the $18,621,655 spent for cancer research during fiscal year 1953.

The Department of Agriculture reports that more than $212 million was spent in the past year on agricultural research, $112 million by the Government and more than $100 million by private industry.

Dr. CAMERON. May I add something, Dr. Heller?

Dr. HELLER. Certainly.

Dr. CAMERON. We have that data in New York, and we would be glad to submit it in addition to what Dr. Heller does. We deliberately left it behind because every time we have used figures of that kind before congressional appropriations committees it has created a high offense.

Mr. ROBERTS. I do not know what it would create, but if it will create more interest in this problem I think we are all for it.

The CHAIRMAN. Any further questions, gentlemen?

Mr. ROBERTS. That is all, Mr. Chairman.

The CHAIRMAN. If not, we have arrived at a time when it would be appropriate probably to stop and have a recess. There is a lot to be covered, I will say to the committee, this afternoon as a result of our long questioning this morning. It has put our schedule back a little bit, so that I hope when we adjourn now until half past 1 that the members of the committee will meet promptly so that we can proceed with diligence this afternoon.

(Thereupon, at 12:30 p. m., Friday, October 2, 1953, a recess was taken until 1:30 p. m. of the same day.)

AFTERNOON SESSION

(The committee reconvened at 1:30 p. m., pursuant to recess.)

The CHAIRMAN. The committee will come to order. Will you proceed, Dr. Heller?

Dr. HELLER. Thank you, Mr. Chairman. I think it is important to stress the element which I mentioned this morning, that it requires teamwork, liaison, and exchange of ideas and intelligence in order to do the job with which we are charged, to do it economically, to do it as efficiently and as effectively as we can. I have asked Mr. Mefford Runyon, executive vice president of the American Cancer Society, to speak briefly to this point.

The CHAIRMAN. Mr. Runyon.

STATEMENT OF MEFFORD R. RUNYON, EXECUTIVE VICE PRESIDENT OF THE AMERICAN CANCER SOCIETY

Mr. RUNYON. Mr. Chairman, may I enter some proposed materials for the record?

The CHAIRMAN. Without objection, it is so ordered.

(The materials referred to follow:)

STATEMENT OF M. R. RUNYON, EXECUTIVE VICE PRESIDENT, AMERICAN CANCER SOCIETY

The American Cancer Society is a voluntary health agency incorporated under the laws of the State of New York as a membership corporation.

It has 60 divisions chartered to carry out its program of cancer control in every one of the 48 States, the District of Columbia, and Alaska, and affiliations with organizations in Puerto Rico, Hawaii, and the Canal Zone.

The 60 divisions have organized local units in substantially all of the 3,000 counties of the United States, so that its program is actually nationwide.

Funds which are collected from the annual drive are initially allocated three ways:

	Percent
National research program	25
Divisions' program of education and service, with some local research support	60
National office for its share of the integrated program of education and service	15

This allocation of funds and division of effort has resulted in a coordinated nationwide program with little or no overlapping. Those things which can best be done nationally, such as laying out and supporting a nationwide program of research; producing educational films for nationwide use; handling publicity for national media such as radio networks, wire services, magazines, etc., are done by the national society. Those parts of the program which can best be accomplished on a State level are done by the State division organization, and those parts of the education and service programs which can best be carried out locally are the responsibilities of the local county units of the State divisions.

Since 1948 the national society has published an annual report in which the total receipts and expenditures of the society are accounted for under the appropriate headings of education, research, and service, with the necessary administration and fund raising. This financial accounting is based upon audited reports and includes all county units, State divisions, and the national society.

The attached tables show total funds collected during the annual drive by the American Cancer Society since 1938; the purposes for which these funds have been expended since 1948; and a copy of the latest annual report of the society describing in great detail its attack on cancer at the national, State, and local level.

Money to fight cancer—How increasing public awareness has swelled voluntary and tax funds to combat cancer

Year	American Cancer Society campaign receipts, year ended Aug. 31	National Cancer Institute, U. S. Public Health Service, appropriations, year ended June 30	Year	American Cancer Society campaign receipts, year ended Aug. 31	National Cancer Institute, U. S. Public Health Service, appropriations, year ended June 30
1938	$133,487.52	$400,000	1948	$13,221,068.76	[1] $14,500,000
1939	171,020.76	400,000	1949	13,596,661.54	14,000,000
1940	210,165.78	570,000	1950	13,933,638.15	[2] 18,900,000
1941	377,388.07	570,000	1951	14,974,513.69	[3] 20,086,000
1942	285,467.89	565,000	1952	16,438,184.65	[4] 19,500,000
1943	372,057.17	534,870	1953	[5] 19,800,000.00	17,887,000
1944	832,862.00	530,000	1954		20,237,000
1945	4,292,491.56	561,000			
1946	10,106,766.92	548,700	Total	120,872,649.76	131,561,570
1947	12,126,875.30	1,772,000			

[1] Includes construction cash of $2,303,000.
[2] Includes $4,175,000 to liquidate construction contract authority.
[3] Includes $5,000,000 to liquidate construction contract authority.
[4] Includes $4,825,000 to liquidate construction contract authority.
[5] Latest year estimate.

American Cancer Society, Inc.—National headquarters and chartered divisions general and research fund expenditures actual Sept. 1, 1948, to Aug. 31, 1952, and budgeted Sept. 1, 1952, to Aug. 31, 1953

	Fiscal years ended Aug. 31—				
	1949	1950	1951	1952	1953
Research	$3,979,725	$3,929,646	$3,728,034	$4,342,444	[1] $6,214,880
Education	3,266,265	3,144,880	3,556,145	4,146,823	4,838,637
Service to cancer patient	2,803,021	2,934,957	3,129,809	3,608,174	4,457,218
Campaign	1,722,740	1,814,951	1,843,980	1,769,695	1,863,118
Administration	1,311,835	1,327,678	1,334,091	1,485,687	1,374,565
Total	13,113,586	13,152,112	13,572,059	15,352,823	18,748,418

[1] Includes $1,584,750 approved for grants and fellowships for the 1953–54 research program.

1952 Annual Report American Cancer Society

FOREWORD

It can be said at the end of 1952 that we have come measurably closer to our goal—the control of cancer. We have made heartening progress in tooling up to save the tens of thousands of lives which can be saved today with present knowledge and for the research attack which will someday bring us freedom from cancer.

There is now strong promise of better weather ahead—but just how far ahead no one can say. Cancer is still an all-pervading biological problem of baffling complexity. It is still a task of unusual and rather surprising difficulty to persuade men and women to take the simple steps necessary for their own protection. Cancer remains a scientific and social problem second to none we face today.

While the advance is necessarily slow, we can look back to the position of the control movement in 1945 and see the radical change which has occurred. In public knowledge of the disease, in the knowledge of our doctors and facilities at our hospitals, and in the determination, equipment, and vast increase in numbers of research investigators who devote their lives to cancer, notable advances have taken place. Perhaps we can say the great achievement of the years since 1945 has been defeating the spirit of despair and raising the spirit of hope. This new spirit can become contagious; once Americans are convinced they can win, they always do.

But here we must be careful. A long look forward is also needed. We must face the fact that the struggle may continue for years. Our victory will be hard bought. We cannot rest while we watch thousands die of this disease when they could be saved with present medical knowledge. Nor can we fail to nourish generously the widely developed and quickening research effort that has been brought into being in recent years.

These accomplishments are due in a large part to the volunteers, and the spirit of devotion which they have brought to the society. Most of the volunteers are impelled by their own personal tragic experience. In 1952, one of the most valiant of this army was claimed by the disease. In the death from cancer of Albert D. Lasker the society and the Nation suffered an irreparable loss. No one gave more of himself because no one knew better the need for sustaining our effort with always greater strength, resourcefulness, and courage.

Because of the continuing vision and devotion of our volunteers we can face the future with confidence.

William J. Donovan,
Chairman, Board of Directors, 1952.

PROGRESS UP TO NOW

As 1952 draws to a close we ask ourselves of our progress in bringing under the control of mankind the centuries-old scourge of cancer. Daily, all of us face the grim facts: A wife, a mother, a husband, a cherished brother or sister, a father, a child, a gallant friend and coworker, a great and honored statesman,

a famed actress, a wise philanthropist, dies of cancer. Approximately 1 in 7 still must go this way—many, far too soon, leaving tasks unfinished.

Certainly, no body of people can be more conscious of the painfully slow progress we appear to be making in the control of cancer than the hundreds of thousands—doctors, scientists, and lay persons together—who give their time or money to the work of the American Cancer Society. For they, most of them, know cancer at first hand and all of them have accepted the challenge which this disease lays down to the human spirit and to their energies. There is meaning, therefore, in the fact that such people today, in some measure are heartened.

It is proper, therefore, in these opening pages of the society's annual report for 1952 to state the facts which give courage to so many. As progress is slow, measured year by year, perspective is needed for the true picture. The society is today in its 39th year, but its present national program, including the now widespread program of research into the basic nature of cancer, dates only from 1945. Progress there was and no lack of determination before that time, but the full will of Americans to strike back at cancer required the historical opportunity which came, in due course, with a revival of concern for health problems at home and the reorganization of the society upon a wide national basis at the close of the World War period. Before 1945, our powers of attack had not been summoned in full strength. That so much has been done in so short a time, when it is known the struggle must be long, promises well for the future.

The collective "we" of the statement is employed unreservedly, for the accomplishment speaks for all and not those alone who are most concerned, as donors or workers, with the society's progress. We have good reason, all of us, to be encouraged by these achievements:

A powerful volunteer striking force: We have created under voluntary auspices in the American Cancer Society an instrument of the determination of the American people to strike back at cancer. It combines the knowledge of the physician, the scientist, the health educator, the social scientist, and the public-health official, with the active concern of the private citizen. A program of action has been developed which each year becomes stronger, sharper, more accurately directed to the ultimate defeat of the disease. More people than ever before engaged in educational and service activities of the society in 1952. More people than ever before contributed to the financial support of the society in 1952—enabling the society for the second year in succession to exceed its announced goal and to maintain its attack with undiminished vigor.

A national research attack: The attack includes in its scope, and has included in the past 7 years, the major scientific institutions of the country, the accredited schools of medicine and research hospitals, and many hundreds of individual research scientists, physicians, and research technicians. A primary focus on cancer as a disease entity has been created from studies which in the past were dispersed—a concentration of effort which is resulting in a slowly but surely growing body of specific information on the nature of cancer in man. The society bears a large share of the responsibility for the aroused spirit of scientific inquiry concerning cancer which exists today.

Increased interest by physicians: With the warm cooperation of medical societies of all kinds and schools of medicine and nursing, we have encouraged members of the medical profession in all parts of the country to take a greater interest in cancer as a curable disease. Through the society we have supplied and are continuing to supply doctors with the latest and best information on approved treatment procedures, including diagnostic and detection techniques not commonly available a few years ago. The cancer patient today in many parts of the country has a far better chance of receiving adequate and prompt treatment for his disease than in past years.

Cancer can be discussed now: Strongly supported by educators of all kinds, by the press, radio, television, and other means for communication with great numbers of people, we have lifted—largely through the work of the society—cancer from a position of blind and unreasoning dread in the minds of many people to the point, at last, where the disease can be openly faced, accurately reported, and boldly examined for all its consequences—economic, medical, and social—to the American public.

Health habits formed without unreasoning fear: Through continued stress on the curability of many forms of early cancer, and wide dissemination to the public of the bodily signs which may mean early cancer, we have made it possible for a very large number of people to adopt without unreasoning fear the sensible health habit of regular physical examinations by a physician. Undoubtedly, many lives have been saved from cancer by this practice, strongly encouraged

by the society in the past 7 years. Cancer is properly feared—it is unreasoning fear that is dangerous. In the same process, we have diminished the hold of the cancer "quack" on those who fear but lack real knowledge of cancer.

Service program begun: We have laid the foundations for service to persons suffering from cancer and to members of their families. Primary emphasis is given to early detection of the disease and prompt and more positive treatment, but aid is also extended to patients in need in later stages of the disease in areas where that activity seems necessary and desirable. In acceptance of the fact that cancer in later stages often means financial disaster for the patient and his family, the society has encouraged more effective measures in public assistance.

Treatment facilities established: We have made possible the establishment of formally organized cancer diagnostic and treatment clinics within many general hospitals. Here physicians can bring to bear on a particular cancer case the force of their collective medical experiences and medical skills. Patients in many parts of the country, formerly without such services, receive the highest medical consideration available to their communities. The society has given much attention, many voluntary services, and large sums of money to the establishment and support of these clinics. There is a need for many more of them.

Manpower has been trained: We have encouraged, with fellowships and scholarships in leading scientific institutions, many hundreds of younger scientists and physicians of promise to make life careers of the study and treatment of cancer. This has added weight to the contemporary attack upon the disease and at the same time has begun to provide for the scientific and medical manpower which will be needed to sustain the attack in future years. By such means, consistently employed by the society and the National Cancer Institute of the United States Public Health Service, the number of talented younger men and women who are devoting their lives to the defeat of cancer grows larger year by year.

Plant equipment: Through the construction program of the National Cancer Institute and by substantial private philanthropies, plant equipment has been increased significantly for the research attack upon cancer. Under the Institute's building program, new laboratories and other facilities exclusively devoted to cancer studies have been added to the equipment of 49 medical and scientific institutions in 27 States. Since the war over 15 major cancer hospital and research institutions have received large private gifts for building purposes. Fellowships and studies financed by the society are today often housed in these new research facilities.

Cancer registries and records: We have improved our recordkeeping of the prevalence and mortality of cancer in many States, local communities, and individual hospitals to the point where we begin to see more clearly the true dimensions of the formidable enemy we face. Cancer registries keep patients during and after treatment in closer touch with their doctors and provide the medical profession as a whole with more accurate and more complete information on the value, as proved in time, of treatment procedures. The society has had an active role in this useful epidemiological development.

An integrated national cancer control program: Besides the educational, research, and service programs of the society, the national attack includes complementary control and research activities by the Federal and State Governments. The society consistently supports and participates in these programs and has played a significant part in testimonies to congressional committees and other activities in obtaining for the National Cancer Institute of the United States Public Health Service annual appropriations of reasonable adequacy for the task at hand.

The American Cancer Society strives to be hopeful but realistic, conservative but open-minded, constantly self-critical, ready for change when change will lead on to better things. It holds to the classic American belief that responsibility for one's self and one's fellow citizens may never in entirety be delegated to others, and that in the case of cancer, in particular, this doctrine must hold especially true because the individual is at all times personally and directly threatened by the disease. Oneself—you and I—must take the early symptom to a doctor.

For this reason—of a personal responsibility in the control of cancer—the society believes it can serve the American public most effectively through combining its educational efforts with its own fund-raising activities. We learn through the educational effects of giving to care for ourselves, our neighbors, and what must be done perhaps for many years to come, to defeat cancer. In most cases the sharpness of the educational effect is diminished where the cancer crusade is combined with other appeals, no matter how worthy—lives may be unnecessarily sacrificed.

Though the society thus strongly supports the voluntary spirit in all its affairs, it believes this admirable readiness to serve, and to learn, must be strengthened and guided everywhere by the best technical advice. It is needed, for one thing, to engage the full interest of the intelligent voluntary worker. For such reasons, the society makes wide use of expert technical advisory committees—in education, in the social services, in medicine, and the basic sciences—and it insists upon the employment of persons in salaried staff positions of the highest professional competence for their daily tasks. The Committee on Growth of the National Research Council is a notable example of the expert voluntary advisory services made use of by the society in its program.

The following three sections of the report discuss the activities of the society during 1952 under headings representing its principal structural parts—the National Society, the State, Territorial, and metropolitan divisions, and the community units. Other sections are devoted to research, fund-raising, and finances of the society.

The reader should bear in mind the need for perspective in considering cancer. The road has been and will be, probably for many years to come, a hard one. The gains are measured in inches, not miles. The great achievement of the present is the mobilization of the attack—the organized willingness to strive—everywhere evident in 1952 activities. Nevertheless, time, work, thought, training, organization, money, are still basic requirements of ultimate success.

Bear in mind also—

Every day over 600 Americans die of cancer.

Out of every 7 deaths last year, 1 was caused by cancer.

Cancer strikes 1 in every 2 families.

About 220,000 Americans died of cancer in 1952.

About 15 million Americans will die of cancer in the next 50 years if present trends continue.

In 1953 there will be about 525,000 new cancer cases in the United States.

In 1953 about 700,000 persons will be under treatment for cancer in the United States.

In 1952 about 70,000 Americans were saved from dying of cancer.

The number of cancer patients saved in 1952 could have been doubled if every cancer case had been treated early and by the most effective methods.

We still do not have a readily applied test for cancer or a means for cure effective at any stage of the disease.

THE NATIONAL SOCIETY FIGHTS CANCER

The war against cancer has been only fairly begun. Though the end of the beginning may be in sight, the beginning of the end is still far distant. The enemy is still implacable, still deeply entrenched in the pits of our ignorance, its threat still growing through the growth in our population and in the numbers of older people who make it up. Cancer strikes the older person far more often than the young.

It is one of the purposes of the national organization of the society to hold the gains which have been made. That in itself is no small task. But an even more important purpose is leadership in the attack—through direct action in public and professional education, service to the patient, and research into the nature of cancer; and through indirect actions, designed to enlist in the national undertaking other national agencies, official and private, which can be helpfully employed in the struggle. There are but few agencies which may not be so employed.

A duty of the national society, moreover, is to provide guidance and assistance to the combat troops of the society—the divisions—in the carrying out of programs within each of the 61 divisional areas—in every State, the Territories of Alaska and Puerto Rico, the District of Columbia and 10 metropolitan areas.

The leadership role

The world cancer picture is today in a state of great change, much of it due to knowledge of the disease and of means for its control gained in postwar years—much of it resulting from the society's work. Some of the advance in our knowledge is medical and scientific in its nature; some can be called "social," as betokening advances in other health and welfare activities; some is educational, involving newer methods for influencing the actions of people; some is administrative, in the sense that experience with any problem increases the

ability to deal with the problem. It is the duty of the national society to relate these advances in knowledge to each other, to study and judge them, and, when deemed practical in saving lives from cancer, to translate them into positive programs speedily and effectively in one or more departments of the society's work. Complex and difficult decisions are often involved.

A number of examples of the principle here at work as expressed in actions of the national society in recent years are of interest. How early is early enough for the best chance of cure in the treatment of certain forms of cancer? Much attention has been given in medical and scientific literature to refinements in the general concept of early treatment as offering the best hope of cure. In general, the earlier the better remains still the basic rule for all forms of cancer: The 7 danger signals (page 14) which may mean cancer are still the signs to take one to a doctor at the earliest possible moment. But we are beginning to learn that if the right social and medical actions are taken, some forms of cancer may be discovered even before signs of disease can be obvious to the layman. If a woman will learn to examine her breasts at regular monthly intervals, the lump or other sign which may mean cancer can be discovered earlier than if discovery is left to chance, even though the woman is well informed on the basic importance of early treatment. Similarly, cancer of the uterine cervix, which takes the lives of nearly as many women every year as breast cancer, can be detected by the effective "smear test" long before obvious signs of disease occur. If women will present themselves periodically for smear examinations for cancer of the cervix, more than twice as many could be saved from this form of the disease as are saved at present. Lung cancer is on the increase out of all proportion to other forms of the disease, particularly in men above fifty. Precisely why is not known, though in another exercise of the national society's leadership function a study was initiated over a year ago to see if there is any relationship to smoking (page 29). If a cause can be learned, better means for control will follow. What is known about lung cancer today is that in far too many cases it is found too late for much hope of cure and that its earlier detection through semiannual chest X-rays, especially for men over 45, could raise the present cure rate for this form of the disease from less than 4 percent of all cases up to 50 percent.

Such approaches to the control of cancer are new and have been named "precision" attacks. They are based on methods we could not have sponsored a few years ago. It will be seen that all three possibilities involve social as well as medical actions, that all three call for education to induce people in the mass to take the necessary steps in advance of the medical detection of the disease, and that in each case special equipment or a tactical method is a requirement. In launching such programs it is the national society's responsibility to point the way, to forge or help forge the special weapons which may be needed, and to reenforce the attack by actions taken with other national groups. Comment will be made on these activities in following pages of this report.

The national society's pioneering institutional grants which make possible large research programs following several lines of inquiry at once and reenforcing the more general research attack of independent projects (p. 47), is a further illustration of the leadership role exercised by the national society. Another example is the attention given to the society's accounts, operating budgets, and annual financial statements (pp. 56–64). Still other illustrations are the use made in public and professional education of new techniques in films, radio, and television, pamphlets, discussion-group practices.

Make-up of the National Society

The national society—legally, American Cancer Society, Inc., a membership corporation of the State of New York—is headed by a national board of directors of 56 members; one-half are lay persons, one-half representatives of the medical and scientific professions. To preserve continuity, membership is staggered in 2-year periods. All are democratically elected.

The national board is composed exclusively of volunteers. The president of the society is always a physician or a scientist, the chairman of the board a layman. Women's interests are represented by a vice presidency which can be held only by a woman. For coordination, the Director of the National Cancer Institute, the Federal agency responsible for the Government's program in cancer control, is a member of the national board.

Much of the work of the board is conducted by committees of board members and technical advisers who may not be board members. Principal standing committees of the board are the medical and scientific committee (composed

of all medical and scientific members), research committee, committee on field organization, and finance committee. Aiding the society with technical advice are the professional education committee, clinical fellowships committee, service committee, statistics committee, nursing advisory committee, medical social work advisory committee, the institutional grants advisory committee and, outstandingly, the committee on growth.

Public education

Of the 220,000 people who died of cancer in 1952, 70,000 could have been saved if they had received treatment in time. We must keep everlastingly at it. Education, thought, care, are of the essence. With present knowledge alone, and use of precision methods, if people would see their doctors upon the first appearance of a sign which may mean cancer about twice as many people could be saved from the disease as are being saved at present. The signs which may mean cancer are:

1. Any sore which does not heal.
2. A lump or thickening, in the breast or elsewhere.
3. Unusual bleeding or discharge.
4. Any change in a wart or mole.
5. Persistent hoarseness or cough.
6. Persistent indigestion or difficulty in swallowing.
7. Any change in normal bowel habits.

But knowing the signs is not enough. People should know that if untreated the disease will spread and once that happens there is little hope of cure. They should know the examinations which may be made at home or by the doctor to help detect certain forms of the disease, as breast cancer, cancer of the cervix, and lung cancer. They should know that only surgery, X-ray, and radium can actually cure cancer and only when treatment is early—that quack treatments cost lives. Moreover, people are persistently interested in research: What have we learned about cancer that we did not know a few years ago? Has a new and certain test for cancer been discovered? A new cure?

In 1952, the national society continued to supply in great volume, to national media of communication—newspapers, magazines, radio, and television—reliable information on the curability of many forms of cancer when treatment is early, on the fatal character of the disease when untreated, on our hopes for research. It worked with other national organizations so as to encourage their interest in cancer. And it provided the divisions with counsel and educational materials in broad range—films, radio, and TV features, exhibits, posters, pamphlets.

Notable was a tour sponsored by the society in March and April of 12 nationally known science writers to research centers in 9 principal cities. Over 200 research workers were interviewed, all phases of the research outlook reviewed. Probably never before has the American public been given so much solid, well-reported information on cancer research as through the clearly written articles which appeared in hundreds of newspapers and magazines in all parts of the country. During 1953 it is planned to round out this national report with visits to other research centers.

During the year the national society continued its series of educational advertisements which are published, free of cost to the society, in space generously contributed as a public service by national magazines. In 1952 a series of advertisements was issued urging people to protect themselves from cancer through knowledge of the disease, and a second extensive series urged support for the April appeal for funds. The advertisements appeared in magazines totaling in circulation more than 182 million readers.

A valuable service of the national office is to writers preparing articles on cancer. Readership studies have demonstrated the great interest in the disease. But articles must be accurate and well judged so as not to cause either fear or false hopes. It was gratifying that in 1952 more and more writers and editors made use of the national office for review purposes and for sound information on cancer.

A constructive development has been the increased willingness of many newspapers to list cancer as a cause of death in obituary columns. This is by no means a routine procedure but a few newspapers throughout the country have made a practice, where families permit it, of mentioning cancer in death notices. Time magazine follows this custom. In 1952 the deaths of a number of prominent persons were rather widely reported as due to cancer.

Motion and still pictures tell the cancer story clearly and quickly. Many hundreds of still pictures showing research and other cancer activities were taken during the year. Especially noteworthy was the release of the society's color motion picture, Man Alive, produced by UPA, creators of Gerald McBoing-Boing and Mr. Magoo, employing clever psychological characterization to stir men from a dangerous apathy concerning the threat of cancer to them.

Life magazine, with about 13 million readers, devoted 4 full pages to a highly favorable review of Man Alive, saying "grim but funny." The Saturday Review of Literature, in a roundup of comment on meritorious educational films, said "local and State cancer groups have done remarkably well in having their films brought to the public eye * * * Man Alive makes a lively and sensible addition to any kind of adult film program." By the end of the year, the picture was being widely shown in commercial theaters in divisional areas, as well as to many smaller gatherings. Six hundred and thirty 16 mm. prints were in use by the divisions at the year's end.

Breast self-examination, the effective 10-minute movie jointly produced by the society and the National Cancer Institute to lead the precision attack against breast cancer, continued to be widely shown in 1952. About 2 million women have seen the picture since its release 2 years ago. But nowhere near enough women have yet seen the film or learned the wholesome health practice it teaches.

In radio and television the national society was greatly aided in 1952 in the educational work of the April appeal by a skilled advisory committee for radio and television on which 30 advertising agencies were represented. In result, the usual support of the radio and television networks during April was more generous than ever.

The national office produced and distributed through the divisions in 1952 for local radio stations 450 sets of a new series of transcribed dramatic programs on cancer, But Where Today? Well received, also, by local stations was a new series of musical transcriptions, Songs for America, each with a 3-minute cautionary message from the society—715 sets were employed by the divisions. Slides and other visual materials for television were also provided in large numbers.

Cancer News, the national society's popular magazine, was given a new format in 1952 and a new appeal for the general reader in illustration and content. It reached with timely articles on developments in the cancer control movement 70,000 readers every quarter. The ACS Bulletin, a fortnightly for operational personnel, continued its aid on "how-to-do-it" for volunteers, division and unit staff people. Circulation is 13,000.

Service to divisional educational activities required the production and shipment on order of the divisions of 12,888,390 pamphlets, 168,705 posters, 1,648 films, 6,871 cardboard-display units, 1,326 sets of radio transcriptions, and 169 sets of TV films and slides. The count does not include educational materials prepared by the national office for divisional use in the April appeal—in all, some 40 million additional pieces.

An important technical service of the year to the divisions was the completion of a new Handbook for the Public Education Chairman of a Unit of the American Cancer Society. The handbook reflects experience in community educational activities of postwar years. In it, permanent programs are outlined under five main heads—mass media, business and industry, organized groups, schools and colleges, and neighborhood programs. The divisions aided in the preparation of the booklet, indeed it was their hard work which formed it. It should go far to strengthen community educational activities in coming years.

Divisional and unit educational programs owe much to local leaders in health and adult education. For this reason, the national society participated in 1952 in national conventions of the American Public Health Association, and the National Association for Adult Education. It joined in meetings of the American Library Association, the National Conference of Social Work, the National Science Teachers Association, the National Conference for Cooperation in Health Education, the Society of Associated Industrial Editors, and for the second year, in a joint conference of the Industrial Medical Association, American Association of Industrial Nurses, and the American Association of Industrial Dentists. It continued its effective liaison with the United States Public Health Service, the Extension Service of the United States Department of Agriculture, the United States Office of Education.

Professional education

The doctor's office is the key. Will people, in the mass, go to it in time? Will the doctor—and he has seen too much late cancer—be able when people come to him to detect the beginnings of the actual disease? It will be fatal if not treated early. Shall we wait for the sure, quick, cheap test—the certain cure—or shall we try it now, the hard way?

All the doctor's instincts, and actions of his official associations as represented everywhere in society councils, say try now—the hard way. The society's professional educational program is based on that decision. The effort is idle if the doctor has not made the decision himself.

What doctors want, they say in the aggregate, is help for the average practicing physician in his fight with the disease as he must meet it in his office, in his round of calls. The society's professional educational program is designed to give him every help. The program emphasizes earlier detection and diagnosis. It seeks to take to the doctor in all parts of the country tests for cancer such as the effective smear test and to encourage, as routine, better-known procedures such as chest X-rays for lung cancer. It seeks to back up this information with established information on treatment procedures, so that when the diagnosis is made treatment will be positive, prompt, the best available.

Once again, in 1952, the national society made wise use of publications in professional education. It continued to publish and distribute through the divisions to 54,240 readers, CA—a Bulletin of Cancer Progress, the society's effective bimonthly digest of cancer information for the general practitioner. It continued its support for Cancer, the distinguished bimonthly for physicians and scientists specializing in the cancer field. It continued in Cancer Current Literature, to issue the only monthly index of world cancer literature, widely consulted and made use of in medical libraries, schools of medicine, research and medical institutions.

The national society released during the year the seventh and eighth of the Cancer Monograph Series on early diagnosis for general practitioners. The new titles are "Cancer of the Esophagus and Stomach" by Dr. Owen H. Wangensteen, and the "Value of Early Diagnosis of Malignant Lymphomas and Leukemias" by Dr. Lloyd F. Craver. The monographs were distributed in 1952 to 190,000 practicing doctors, hospital residents, and internes.

Late in 1951 the medical teaching film Uterine Cancer; the Problem of Early Diagnosis, was introduced to the profession at the interim session of the American Medical Association at Los Angeles. The fourth in a series jointly sponsored by the society and the National Cancer Institute, the film emphasizes the detection of cancer of the uterine cervix in the noninvasive stage when cure rates of 75 to 100 percent are possible. The precision detection technique of vaginal smears is demonstrated in the picture. In its review the Journal of the American Medical Association said "highly recommended for the general practitioner, the advanced medical student, and hospital staff meetings."

Since the start of the professional film series 5 years ago, 922 prints of the four films produced have been distributed: 352 to divisions, 192 to State health departments, 136 to medical schools, 119 to foreign countries, 193 to the Department of State, Armed Forces Medical Services, and other agencies.

The national society expanded the services of its professional film library during the year; the 622 requests accommodated nearly doubled those of any previous year. One hundred and eighty-eight sets of the society's kodachrome slide library of 482 slides of lesions of early cancer were in use by medical lecturers in 1952.

Several new exhibits were made available for medical meetings during the year. A comprehensive exhibit on cancer of the uterus was first shown at the June convention of the American Medical Association. An exhibit on lung cancer was introduced at the annual meeting of the National Tuberculosis Association in Boston in May. A new exhibit for nurses had its initial showing at the 1952 biennial nursing convention in Atlantic City in June.

Clinical fellowships program

The national society's fellowship program for younger physicians has become the most comprehensive medical fellowships entrprise undertaken by any organization—voluntary, governmental, or private. Since its beginning in 1948 through June 30, 1952, 202 younger physicians of promise have received advanced training in medical specialties bearing on cancer, such as surgery, radiology, internal medicine, pathology, and gynecology. At the end of the academic year on June 30, 70 physicians were in training in 35 institutions. At the beginning of the

new training period on July 1, the number was increased to 75 physicians in 36 institutions. In addition, the society gave financial support in 1952 aiding the training of 43 younger physicians in the 4-year training system of the Memorial Cancer Center in New York. What is more, medical institutions approved for graduate training have been informed the society's fellowship program will be expanded, effective July 1, 1953, to allow the advanced training of 88 physicians in that year.

In 1952, additional fellowships in exfoliative cytology were awarded to 8 pathologists, bringing to 38 the number receiving training since 1948 in this vital diagnostic technique.

This sustained training activity is saving lives today, in every State through the influence of these specially trained physicians. It is carried as a regular portion of the budget of the national society; $330,840 was devoted to the program in 1952—$900,195 since 1948.

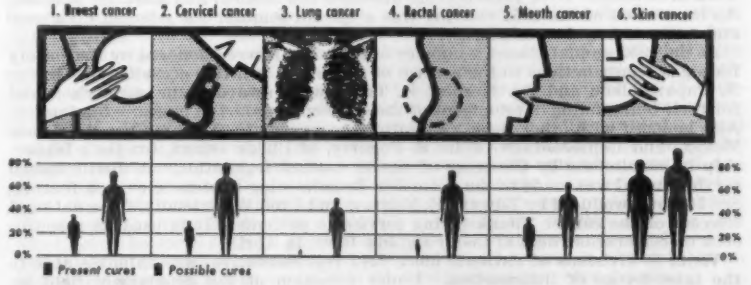
National cancer meetings

The exchange of knowledge between physicians and research workers is of the highest importance in the fight against a disease so complex, varied, and little understood as cancer. In cooperation with medical and scientific groups, the society supports these meetings in many forms—refresher courses, seminars, teaching days, clinics—national, within the divisions, in cities and counties of the units.

At the national level, the society and the National Cancer Institute sponsored the first national cancer conference, held at Memphis in 1949, attended by over 600 doctors and scientists. In 1952, the society joined with the Institute and the American Association for Cancer Research in support of the second national cancer conference, held in Cincinnati in March. At Cincinnati, more than 1,400 physicians and scientists from all parts of the United States and several foreign countries heard 325 presentations summarizing recent clinical and research findings on cancer. Proceedings of the conference are being published by the society.

Scientific sessions of the annual meeting of the society in October brought together another group of over 1,000 physicians for a 3-day discussion of radiation versus cancer; a critical evaluation. Published proceedings of the sessions will be made available to the profession in the near future. A smaller meeting of medical leaders sponsored by the national society in 1952 was the lung cancer conference, held at Chocorua, N. H., in September.

Six forms of cancer now open to a high measure of control through precision detection attacks



1. Monthly self-examination of the breasts by women over 35 will uncover more breast cancer in early stage.
2. Semi-annual pelvic examinations of all women will disclose more early uterine cancer.
3. Semi-annual chest x-rays of all men over forty-five will reveal more early lung cancer.
4. Annual digital and proctoscopic examinations can identify most rectal cancer in curable stage.
5. Regular examinations of the oral cavity and larynx will find cancer when highly curable.
6. Examinations of the skin are performed in a few minutes and will detect early skin cancers when most are curable.

Miscellaneous grants

The grants are made upon recommendation of the medical and sicentific committee to support nonresearch undertakings which further the control program. In 1952, the American College of Surgeons, the World Medical Association,

l'Union Internationale Contre le Cancer, the Commission on Chronic Illness, the American Association for Cancer Research, the Committee on Cancer Diagnosis and Therapy (National Research Council), among others, received support. Thirty-eight requests for grants of this character were received during the year, of which 19, totalling $74,120 were acted upon favorably.

Service to the cancer patient

As service must be extended where patients live, most of it is conducted by the divisions and their community units. Nevertheless, problems of the cancer patient are foremost considerations of the national society. How can this difficult sociomedical problem, often involving whole families in later stages of the disease, best be handled? Seven hundred thousand persons are ill of the disease today. Over 500,000 new cases are diagnosed each year. Their care is a large burden for the Nation.

Certainly, the most practical tactic is to increase the number of persons cured of cancer. Public education helps, so also professional education and research. One attack with present knowledge is through cancer diagnostic and treatment clinics in general hospitals which bring to bear on the patient all the knowledge of the hospital staff and the hospital's clinical equipment. The divisions support these clinics with money and many voluntary services. Only 655 clinics had been approved by the American College of Surgeons at the end of 1952. There is general agreement that many more are needed.

Notable have been enabling grants, since 1947, to the American College of Surgeons to establish standards for clinic operations believed desirable by the medical profession. Assistance to nursing organizations have been helpful. Useful also have been recommendations and services of the national society in the recordkeeping of clinics—essential in patient management and for evaluation of treatment procedures.

Field relations and administration

All parts of the society must work together—the national society, the divisions, the units—doctors and lay persons—advisory committees—voluntary workers and staff members. The exchange of information is vital. Many devices are employed by the national society, and encouraged within the divisions.

Mention has been made of Cancer News and the ACS Bulletin. But seminars, conferences, training meetings of all kinds, are vigorously employed. During 1952, the divisions reported 2,846 separate meetings, attended by an estimated 77,445 volunteers and staff persons. At the annual meeting of the national society, besides discharge of stated business of the board and the election of directors and officers, there is a refresher activity. Four hundred volunteers and staff people from all parts of the country attended the 1952 meeting in New York in October. Over 1,000 doctors attended the medical and scientific sessions. An innovation of the 1952 meeting was a special seminar for selected divisional and national board members.

At the 1952 annual dinner a number of individuals were honored by the society for signal contributions to the control of cancer. Upon this occasion Dr. George N. Papanicolaou and Dr. Herbert F. Traut were awarded the society's medal for their outstanding development of the cytologic method of cancer examination. Also honored with other society's citations were Senator Dennis Chavez, of New Mexico, and Representative John E. Fogarty, of Rhode Island, for their leadership in enactments by Congress of cancer control legislation. A distinguished service award was made to the Columbia Broadcasting System television feature, See It Now, produced by Edward R. Murrow and Fred W. Friendly, for a national telecast of the cancer Thanksgiving service to patients. It is used as a source book on celebration, held at Cedar Rapids, Iowa, in April.

Visits to divisions of national office field representatives are valuable aids to the interchange of information. Under direction of the department field relations, these trained members of the national staff consult with the divisions on a wide range of problems—education, service to the patient, training, management, finance, the April campaign. In 1952, several technical studies of administrative problems were completed upon divisional request. A total of 868 man-days were employed in 54 divisions in these activities.

Members of the medical and scientific department staff are also frequently in the field to address professional meetings. In 1952, the staff of the statistical research section traveled to many States for training and supervisory actions on the smoking study and other duties. So also, representatives of the public relations department and the comptroller's office made visits to the divisions for

problems in their areas. A total of 1,897 man-days in 58 divisions was employed by the national staff in this basic activity in 1952.

Relations with the National Cancer Institute

As has been noted the Director of the National Cancer Institute is a member of the national board. Correspondingly, James S. Adams, chairman of the research committee of the board, is a member of the National Advisory Council of the Institute and Dr. Frank Adair, former president of the society and board member, and Dr. Charles S. Cameron, medical and scientific director and vice president, are respectively chairman and member of the Control Grants Section Committee of the Institute. In 1952, so as to strengthen the liaison between the society and cancer control programs of the Federal Government, a Washington representative was appointed by the society.

In February, Mr. Adams, Dr. Cameron, and a group of distinguished research scientists and physicians—Dr. C. P. Rhoads, of New York; Dr. Sidney Farber, of Boston; Dr. Leon O. Jacobson, of Chicago—presented testimony before House and Senate committees in support of more adequate appropriations for the work of the Institute. Congress increased by more than $2½ million the funds which will be available to the Institute in 1953—$17,887,000 as against a proposed appropriation of $15,371,000.

These funds will be expended for research and medical education, and in official control projects within the States, thus helping in the expansion of many phases of the society's attack on cancer.

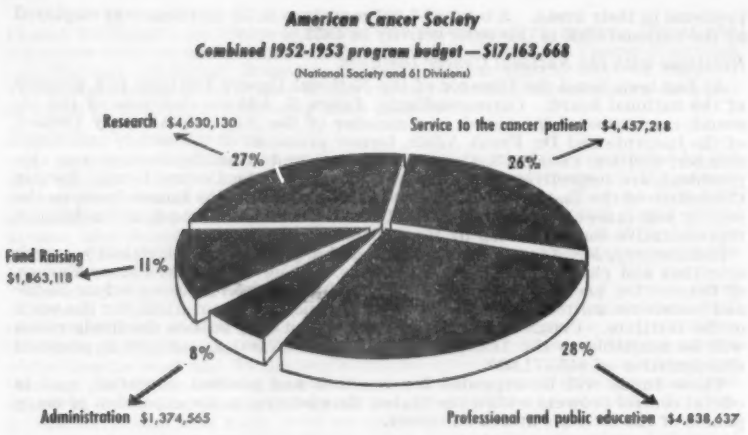
Finance—fiscal control

The national society leadership responsibility is exemplified by budget procedures established in recent years to control expenditures and in the financial accounting of the National Society and its 61 divisions. The society follows latest developments in accounting practices so that its affairs will be administered on a basis comparable to an efficiently conducted major business.

Expenditures from the 15 percent of contributions accruing to the national society are controlled by a budget processed well in advance of the start of the fiscal year. Departmental budgets are prepared, coordinated into an overall budget, further reviewed by the finance committee of the board before board approval. When approved, the budget becomes a guide and control for expenditures. In practice, in the 1952 fiscal year, the cost of the national society's program was $2,309,000—95.8 percent of the announced budget of $2,410,000.

Expenditures from the 25 percent of gross annual contributions allocated to the national research program are controlled with similar care. Applications for research assistance are studied by the research committee of the board or the committee on growth before grants are made by the board. Grantees are required to submit detailed budgets outlining proposed expenditures. They must furnish periodic reports of expenditures and adhere to the society's regulations on grants. Further controls provide for visits by national office auditors to check reports of expenditures with the institutions' records.

The national society works with the divisions in the establishment of similar practices with respect ot the 60 percent of total contributions employed in their programs. Charters of the divisions include standards providing for the submission of budgets aproved by divisional boards and adequate narrative explanation. Divisions also furnish the national society with audited annual financial reports prepared by independent public accountants. From these reports, a combined budget and combined financial statement are prepared and published each year by the national society. The society takes pride in having been the first national voluntary health agency with geographical divisions throughout the country to present such a report to the public. For the 1952 fiscal year, the society's total combined program budget was announced as $15,891,000, whereas the actual cost was $15,325,000—96.4 percent of the forecast. Below is a graph of the society's 1952–53 combined budget—for details.



THE DIVISIONS FIGHT CANCER

The divisions are separately incorporated under the laws of the different States but bound to each other and the national society by charter of the national organization. Usually, they are named "American Cancer Society, ———— Division." Some of the older divisions are organized by metropolitan areas, but the usual area of operation is a State. Sixty-one divisions of the society, operating through 3,301 local organizations or community units, carried forward the fight against cancer in 1952, in the 48 States, Alaska, Puerto Rico, the District of Columbia, and 10 other areas.

Responsibilities of the divisions

Much of the divisional attack is carried by the community units which make up the total divisional structure. But as divisional offices usually have direct responsibility for certain programs as well as for overall direction and general policies of the units, comment is in order to make clear the relationship between divisional and unit organizations.

As a rule, medical programs can best be handled at the divisional level where total needs of the area are visible and contact with central medical organizations on policies can be continuous. Thus, decisions concerning the relative emphasis to be given detection examinations in the doctor's office or in detection centers are reached at the divisional level and programs placed in operation. Similarly, educational programs for doctors and nurses, support for diagnostic and treatment clinics in hospitals, and programs for the various technical services needed by doctors in the detection and treatment of cancer are usually formulated and directed by the divisions. Generally, the decision concerning the kind and extent of support for services for patients, such as nursing services, is made by the division. The divisions have major responsibilities in public education and training of volunteers. Finally, a primary and climatic responsibility of the division is the conduct within the divisional area of the society's anual drive for funds. The cancer crusade is conducted as a major educational program as well as an appeal for the funds to maintain and strengthen the society's work. These duties involve constant planning of where and in what form divisional resources may be used to best advantage. Budgets for divisional and unit activities and the control of expenditures are constant preoccupations of divisional offices.

Divisional direction

Divisional boards of directors are composed, as is the national board, of both lay and professional members—a formula vitally important to a society whose purposes are both medical and social. For greatest effectiveness, units are represented on the boards and the major medical, scientific, and lay interests on the area. In 1952, 2,452 persons were serving on divisional boards of directors: 1,162 were doctors and scientists, 1,290 lay persons.

At divisional headquarters is a small staff, consisting usually of an executive director, assisted as required by an educational director, a service director and a publicity director, with the necessary field representatives to maintain contact with the local units. Always, the medical and medical service program is carefully planned by the medical committee of the board to make sure it corresponds with policies approved by the medical profession of the area. Where they exist, cancer committees of State medical societies and the cancer control sections of State departments of health are often represented on the board.

Sixty percent of the contributions made by the public is retained by the divisions from annual collections for divisional programs. The programs are closely linked in plan and execution with activities in research, public and professional education, and other fields of the national society. Thus, the full program of the society is constantly expressed, and all funds, divisional or national, devoted to the defeat of cancer at all times within each divisional area.

Public education

Some idea of the broad sweep of divisional public educational activities may be gained from statistics taken from divisional reports for 1952:

35,647,910 copies of cancer's Seven Danger Signals were distributed in divisional and unit public educational activities.

18,453,504 separate pamphlets describing the disease were distributed.

44,695 showings of the society's educational films were arranged.

446,903 posters were displayed.

15,029 store windows and other displays were exhibited.

2,689 radio and television stations made use of the society's transcriptions, special scripts, spot announcements and other features, in 7,543 individual broadcasts and telecasts and 46,812 spot announcements.

A vast number of articles, editorials, news stories, and photographs were published in State and regional newspapers, magazines, and organizational periodicals for which divisional and unit activities supplied factual content on cancer.

Programs with organized groups

Educational programs with organized groups have been a notable feature of the divisional educational attack over many years. In 1952, an estimated 18,478 separate educational programs of this nature, usually involving the showing of films and a talk by a medical or lay volunteer speaker, were conducted by the divisions and their units.

Amongst cooperating organizations frequently mentioned in divisional reports are the women's clubs, men's service clubs, farm and home demonstration clubs, the junior league, parent-teacher associations, American Legion and Veterans of Foreign Wars Auxiliaries, junior chambers of commerce, business and professional women's clubs, the Farmers' Union, State organizations and locals of the American Federation of Labor, the Congress of Industrial Organizations, and the International Ladies' Garment Workers Union, the Rebekahs, the Order of the Eastern Star, the League of Catholic Women, the United Order of True Sisters, the League of Jewish Women, and many other church organizations of faiths of all kinds.

Doctors and others especially equipped to discuss cancer are in constant demand as speakers in these group educational programs. For this reason most divisions maintain standing speakers' bureaus. In 1952, 42 divisions reported speakers' bureaus in their areas staffed by 2,699 medical and lay persons, all of them volunteers. In Pennsylvania, 1,252 talks were given to audiences of 65,561 persons. In New York 981 doctors spoke at various meetings during the year.

Precision attack—breast cancer

The film Breast Self-Examination, jointly produced 2 years ago by the society and the National Cancer Institute, leads the precision attack against breast cancer. It is a weapon ideally suited to close-up fighting through community action. The divisions report 15,625 showings of the film in 1952 to an estimated audience of 1,057,252 women. The figure brings the total of those who have seen the picture since its release to above 2 million women—still only 6 percent of the target audience.

Among interesting breast self-examination programs undertaken during the year was a 2-year project in Utah for showing the film to the women of the

Church of the Latter Day Saints. Many industries employing large numbers of women made use of the picture in health programs during the year. For the past 2 years the Bell Telephone System has been especially cooperative in this respect.

Business and industry programs

Another weapon is education at places of work in businesses and industries of the home community. Often these are continuing programs conducted in steps, ranging from the distribution of warning leaflets to the showing of the society's films and talks on cancer by volunteer speakers. In 1952, the divisions report that 5,513 programs were conducted for an estimated total audience of 865,627 people.

It is apparent from the year's reports that more and more employers are recognizing that cancer can be a major economic problem as well as a personal problem for the individual employee. Many lives are lost which can ill be spared; many hours of work are disturbed by anxiety for a cancer patient at home. The Iowa division quotes one personnel director as saying, "In all my years of personnel experience, this program is the best thing I ever got tangled up with." But most employers still fail to realize that an educational program is among the services to be expected from the society. The Alabama division reports that a number of employers in its area were astonished to learn the society's educational services "are free."

The Georgia division has been responsible for a highly successful program amongst 1,786 Georgia industries, employing 285,000 people. The southeastern Michigan division is conducting effective programs for General Motors and Chrysler Corp. employees at Detroit. New Hampshire reports 38 percent of the larger industries of the State are cooperating in education. Notable support was received during the year from the Industrial Medical Association, the American Association of Industrial Nurses, and labor unions. But there are today over 60 million persons employed in industries in the United States—the work has only been started.

School and college programs

The divisions report that 10,095 school programs in 1952 reached an estimated total of 1,328,574 students of high-school grade, and that 444 programs were conducted for 88,561 students at the college and university level. These substantial figures promise well for a stronger control of cancer in the future.

In Connecticut, students of the Yale University School of Drama at New Haven prepared television presentations on cancer which were widely broadcast in the area. In Idaho, students of speech at Ricks College, Rexburg, assumed responsibility for the second year for radio talks and public meetings sponsored by the division. In Iowa 16 students in sociology of Westmar College, Le Mars, undertook the technical direction of the smoking study which was conducted in Plymouth County of that State.

Especially significant in school programs in 1952 was the number of seminars on cancer for secondary school teachers sponsored by the divisions. In South Carolina, summer schools on cancer at 7 colleges reached 1,000 teachers or potential teachers. College credit is given teachers in Virginia in a cancer workshop conducted at Madison College. A noteworthy program for teachers was sponsored by the Puerto Rico division. Six summer workshops were conducted in Louisiana. Twenty-one divisions held special programs for secondary school teachers in 1952.

Students of biology are the doctors and research scientists of tomorrow. The society's film From One Cell seeks to rouse their interest in cancer as a still unsolved biological and medical problem, as well as to teach facts about the disease. It was again in wide demand in school programs in 1952: 570 prints were in use by boards of education and individual secondary schools during the year. Biology teachers, school superintendents, and State and county departments of secondary education made use of 5,455 copies of the teaching guide which accompanies the film.

Aid from persons cured of cancer

Many persons who have survived cancer volunteer their services in the society's educational programs because they know their experiences will help others to defeat the disease. Persons who have learned a new method of speech following operations for cancer of the larynx appeared most effectively on radio and television programs in many areas during the crusade. The Milwaukee, Philadel-

phia, southeastern Michigan, and Texas divisions, amongst others, report such events. In Kentucky, a Lost Cord Club of 26 members has been formed. Persons cured of cancer aided educational programs in Rhode Island. In Georgia 70 business and professional men who have had cancer are active leaders of divisional and unit service and educational programs.

Cancermobiles

During the year the New Jersey and Virginia divisions placed on the roads the mobile education units which they have received as gifts from their State Federations of Women's Clubs. In New Jersey it was the junior department of the federation which conducted the drive resulting in the donation. The Virginia cancermobile is a memorial for a cancer victim, Mrs. Claude E. Eley. Cancermobiles are bus-type vehicles, equipped with projectors, exhibits, films, literature, et cetera, which travel scheduled routes through divisional territories, visiting fairs, conventions, industrial plants, and rural areas. In charge is an educator. The units are responsible for advanced preparations, publicity, et cetera, the volunteers serving in various capacities as attendants. During the summer, the Virginia cancermobile conducted demonstrations and distributed leaflets at 24 local fairs, attended by thousands of Virginians. The New Jersey cancermobile had begun a Statewide tour at the year's end.

Education and service for doctors

Statistics taken from divisional reports will reveal the scope of activities conducted by the divisions to aid the doctor in 1952:

48 divisions cosponsored with medical groups 769 statewide, district, and local conferences for the discussion of cancer.

55 divisions report 1,937 showings of films on the early diagnosis of cancer to an estimated audience of 53,886 physicians, members of hospital staffs, nurses, and medical students.

20 divisions report support for teams of doctors, emphasizing medical specialties related to cancer, who conducted meetings for doctors in local areas.

20 divisions sponsored 153 institutes on nursing requirements of cancer, attended by an estimated audience of 4,829 regular and public health nurses. 35 divisions report other training programs for nurses.

15 divisions report special fellowships for doctors, 9 report fellowships for medical students, 8 report fellowships for nurses, 13 report fellowships for the training of cytology technicians.

24 divisions report support in some form for cytologic services to make smear tests more widely available in cancer examinations, especially cancer of the cervix.

23 divisions report activity in some stage of development for mass X-ray examinations for the early detection of lung cancer.

25 divisions are giving support to central detection centers for cancer.

41 divisions report financial or other support for 274 diagnostic and treatment clinics in general hospitals.

All divisions, through these and many other activities designed to assist the doctor, persisted in their efforts during the year to bring closer the society's goal of making "every doctor's office a cancer-detection center."

Doctors' offices and detection centers

It is understandable that progress in the society's professional educational activities over the years should result in a gradual tipping of the balance as between detection centers and the doctor's own office as places for the detection examination. The Pennsylvania division, for example, reports that formal detection centers have decreased from 40 in 1949 to 25 in 1952 in that divisional area. In the past year 2,021 doctors in 44 Pennsylvania counties expressed willingness to participate in programs for standardized examinations in the doctor's office. In Connecticut, a similar doctor's office program, recently initiated, receives the support of many doctors. The New Jersey division's well-established office program is supported by over 2,000 doctors. The Illinois division reports the closing of 3 detection centers in Chicago, and 3 centers were closed in Georgia. The Milwaukee division closed its popular center during the year, saying that doctors claim every doctor's office in that city is today a detection center.

But detection centers in many areas offer a vital and much-needed service to the public. The North Carolina division reports 1952 to have been its most successful year in its cooperation with the State-conducted detection center

program. The centers have been highly successful in Delaware in stimulating both general and medical interest in cancer. Centers are effectively conducted in Philadelphia. The Brooklyn division states its 7 cancer-prevention clinics in 7 hospitals examined 3,804 persons during the year, over half of whom, though they did not have cancer, had some other disorder in need of medical attention. Two new centers were established by the Maryland and Colorado divisions in their areas during the year.

Precision attack—cervical cancer

The smear test requires much training for the pathologists who read the smears and technicians who screen them. The threefold divisional attack urges that smear examinations be made a routine feature of all examinations, particularly for cancer of the cervix. It encourages with fellowships and by other means special training for pathologists and technicians in reading and screening smear specimens. It offers financial support in many areas for laboratories in which smears, routinely forwarded from the doctor's office, can be rapidly and efficiently processed at nominal cost.

Cytology services for doctors were given direct financial support of some kind in 1952 by 24 divisions. Several divisions were assisting central cytology laboratories. As has been noted, 15 divisions report fellowships for doctors, some of whom were pathologists. Thirteen divisions offered fellowships for cytology technicians.

Precision attack—lung cancer

In 1952, 23 divisions had undertaken cooperative programs of some nature for mass chest X-ray examinations for lung cancer. For the present, the programs are as a rule confined to a few locations within divisional areas and may not yet be described as truly mass in character. But a beginning has been made. Usually the cooperating agencies are medical societies, departments of health, and local chapters of the National Tuberculosis Association and American Heart Association. Usually, expenses are shared and all agencies join in publicizing the activity. Mobile X-ray units are commonly employed, chest pictures centrally screened by doctors, and signs of disease promptly referred to individual physicians for further attention, including diagnosis and treatment in the case of lung cancer.

During the year, the Massachusetts program, cosponsored by medical societies and departments of health, was extended from Boston to the cities of Worcester and Fitchburg. Mobile X-ray units were employed in parts of North and South Carolina, South Dakota, Utah, and New Mexico. Projects in cooperation with tuberculosis sanitaria are under way in Illinois and Puerto Rico. In Oregon, an effective program has been conducted in Portland. Other divisions report programs in the planning stage.

Meetings, refresher courses, fellowships

Divisional and unit conferences for busy doctors take many forms. Some are statewide, some are for districts, some local—within the doctor's own community, where the needs of patients beginning or undergoing treatment are urgent and critical for both doctor and patient. In 1952 the divisions sponsored 62 statewide meetings, 113 regional meetings, 594 county or municipal meetings—a total of 769 meetings of all kinds.

The names of some of the larger meetings in 1952 reveal their character: Colorado—Sixth Rocky Mountain Cancer Conference (July); Illinois—Twelfth Annual Cancer Symposium (February); Florida—Southeastern States Cancer Seminar (November); Kansas—Midwest Cancer Conference (April); Maine—Annual Cancer Teaching Day (October); Massachusetts—Seventh Postgraduate Lecture Course (October); Milwaukee—Sixth Annual Cancer Symposium (April); Oregon—Sixth Annual Postgraduate Course (September); Rhode Island—Cancer Teaching Day (September); Vermont—Fourth Annual Cancer Symposium (April); Virginia—State Program of Postgraduate Instruction in Cancer (year-round); Washington—Annual Dental Refresher Course (February); District of Columbia—Cancer Day, District Medical Society (February); Indiana—Fifth Annual Postgraduate Course in Malignant Diseases; Utah—Fifth Annual Cancer Symposium; Nassau, N. Y.—Annual Refresher Course in Cancer Recognition.

Among smaller meetings were 23 teaching clinics held in Massachusetts in cooperation with the State department of health, and meetings in 19 Boston hospitals for hospital staff members; 5 regional meetings in Wisconsin on chest

diseases cosponsored by the board of health; 2 meetings in Westchester County, N. Y., for the entire medical society and staff members of 6 hospitals; 2 meetings in West Virginia cosponsored by the Academy of General Practice; 2 meetings in Puerto Rico cosponsored by the medical society and department of health; 3 regional meetings in South Dakota cosponsored by the State board of health; 3 meetings in Nevada, cosponsored by medical societies; a symposium on cancer in New York City in cooperation with the New York Academy of General Practice; 24 meetings in 14 hospitals in the Queens, N. Y., area; 31 county meetings in California attended by 1,947 doctors, cosponsored by the cancer commission of the California Medical Association; 56 meetings in Nebraska; 20 meetings in Kentucky on request of county medical societies.

An effective activity was the sixth annual post-graduate course on cancer at the University of Oregon Medical School. Besides doctors from Oregon, the course was attended by 30 Idaho physicians sponsored by the Idaho division and 9 doctors from 7 Alaska communities sponsored by the Alaska division and the Alaska Department of Health. In Texas, post-graduate courses on cancer sponsored by the division were approved by the Academy of General Practice for credit toward requirements of members. A post-graduate course on cancer was initiated at the University of Oklahoma School of Medicine.

In Virginia, a retired physician, formerly Director of the National Cancer Institute, Dr. Roscoe B. Spencer, devotes all his time to a statewide program of cancer seminars and teaching clinics, jointly sponsored by the division, the Medical Society of Virginia, the Old Dominion Medical Society, the State department of health and the extension division of the University of Virginia. In Connecticut, an especially trained physician is jointly sponsored by the division and the State board of tumor clinics as a fulltime consultant for tumor clinics of the State.

Most of these programs were for physicians now in practice. In addition, in 1952, 18 divisions offered 56 fellowships for special training in cancer diagnosis and therapy for medical students and younger physicians of promise. The New York City cancer committee gives substantial support to a large program in several New York hospitals for the advanced training of doctors. These training activities of the divisions are in addition to the extensive medical fellowships program of the national society.

Nurses' training programs

A most effective technique in training nurses in the special problems of cancer patients is the nursing institute. Usually, they are sizeable meetings, held in some central place and lasting for several days, jointly cosponsored by the division, medical societies, medical schools, and departments of health. Besides financial support for the meeting itself, the divisions often provide for the nurse's expense while attending the meeting. Nursing problems in the different kinds and stages of cancer are described and demonstrated, helping the nurse and providing better care for patients within her community. Twenty divisions report 153 nursing institutes attended by 4,829 nurses as having been held in their areas in 1952.

Among other activities of the divisions for nurses are programs and teaching materials for nurses in training—such as the society's film for nurses, What Is Cancer? and its booklet, Cancer, A Source Book for Nurses. The Minnesota division supports one full-time staff member on the faculty of the university school of nursing to help with nursing training. The Montana division employs a nurse for training purposes, and the South Carolina division employs eight full-time nurses for calls on patients and to help train public-health nurses.

Eight divisions offered seventy-five scholarships for nurses in 1952; of these, the Indiana division provided 17 scholarships and the Iowa division 49 full 3-year scholarships, bringing to 182 the number of nurses who are in training or have been trained by the division for service in Iowa.

Aid for cancer clinics

Grants from the divisions make it possible for hospitals to establish and operate cancer clinics which meet standards for approval by the College of Surgeons. The grants are used for the purchase of equipment needed by the hospital in diagnosis and treatment and to help pay salaries of clinic aides, such as a nurse or the medically trained secretary who is usually in charge of the records—always a vital part of the clinic apparatus. As will be noted, the divisions provide many other services to clinics through volunteers of the units. For

1952, 41 divisions report support of some kind for 274 diagnostic and treatment clinics in hospitals of their areas.

Basic grants, supplemented by other assistance, are made to 31 clinics by the New Jersey division which has developed a remarkably broad medical service program. In Indiana 22 clinics are assisted with clerical help and by the provision of radioactive materials for indigent patients. In the past 10 years, the Georgia division has supplied by agreement with the State board of health, one quarter of the X-ray equipment for 17 State-aided clinics. In Kentucky clinics are supported with equipment, secretarial, and nursing assistance; a mobile diagnostic clinic has been supported with great success in the same State. In Florida grants were made in 1952 to 12 clinics for secretarial help and general operating purposes. In Illinois the division made possible the employment of secretaries and medical social workers in 17 clinics. Twenty-nine clinics have been or are now being aided in Connecticut and 59 clinics have been or are now being helped to become self-supporting by the Pennsylvania division. In 1952 27 clinics received assistance from the New York division. Traveling clinics are supported in Oklahoma and Wyoming.

The smoking study

What is the cause of the fivefold increase in the past few decades in deaths from lung cancer? No other cancer has shown a rise anywhere near so great. This form of the disease has become especially prevalent in men of the 50–69-year age group. Many authorities relate some of the increase to smoking, a habit much increased in the same period.

Under authority of the national board, the society set out a year ago to see if smoking was in fact the answer. About 27,000 volunteers in units of the California, Illinois, Iowa, Michigan, southeastern Michigan, Minnesota, New Jersey, New York, Pennsylvania, and Wisconsin divisions are participating in the study. These divisions were selected because of their geographic location and the numbers of men in the proper age group in their populations. In 1952, the volunteers conducted interviews with over 200,000 men above 50 years of age, carefully recorded their lifetime smoking habits. These basic records are now on file at the national office. So large a sample should tell the true story when lung cancer cases, smokers versus nonsmokers, are studied a few years hence.

Though no conclusions concerning lung cancer are yet possible, some preliminary findings on smoking habits are of interest. About 18 percent of the men whose histories are now available for study have never smoked. About 6 percent have never smoked more than occasionally. About 76 percent have been regular smokers. Older men have smoked less than younger men. Older men show a greater tendency to quit smoking than younger men. One-fourth of all polled have dropped from the list of regular cigarette smokers at some time in their lives; one-half of the onetime regular cigar and pipe smokers have stopped that habit.

It is estimated that this study would have cost up to now, at a minimum of $10 per interview, at least $2 million if privately undertaken—about $10 million 5 years hence, when conclusions may be drawn. It was begun in 1952 with no extra cost to the public as a part of the regular duties of national, divisional, and unit staff members and the society's hard-working volunteers.

Many of the men volunteering information on their smoking habits asked for information and cancer symptoms and reported to their doctors for physical examinations. In New York 10 cases of cancer were diagnosed in this manner, most of them in early stages and probably curable.

Divisional research projects

The Divisions occasionally supplement the national research program by support for research undertakings in medical and scientific institutions of the divisional area. In some cases, as in Illinois and California, projects are aided by legacies and memorial trusts, founded by various individuals for cancer research, which are administered by the division. Though serving a valuable purpose, the projects are usually limited in their nature and reviewed by the national society for conformance and consistency with the national research program. In 1952, research projects were being supported by 19 divisions.

Communications—training activities

The divisions have primary responsibility for training activities of volunteers. A great range of topics are involved and many methods employed. State meet-

ings may be in order, sometimes district or local meetings. In general, training materials and techniques developed by the national staff are being more widely used. Noteworthy has been the acceptance of modern participation techniques for adult groups, such as workshops, roundtables, panel and forum discussions. A total of 2,521 meetings of all kinds attended by 77,443 volunteers are noted in divisional reports for 1952. Of these, 59 were statewide meetings, 362 regional or district meetings, and 2,100 local meetings. There were 1,012 meetings on service programs for patients, 610 on public education, and 899 in preparation for the April campaign.

Bulletins and publications

So as to keep volunteers and unit leaders constantly informed of divisional and national activities, 42 divisions publish monthly or bimonthly bulletins. Formats vary from tipped-together mimeographed sheets to letterpress offerings, illustrated with photographs. All are colorful and informative of the society's work.

Occasionally, divisions issue special publications to advance various aspects of programs. Notable in 1952 was production by the Connecticut division of an expertly presented, clearly written Handbook for Workers of the Connecticut Cancer Society, outlining for volunteers all aspects of the divisional program. The Massachusetts division prepared an excellent Teachers Guide for Cancer Education. The California division produced a Lay Service Manual to guide local service programs for patients. The Illinois and Indiana divisions issued special pamphlets to interest employers in business and industry educational programs. An effective undertaking was a film strip prepared by the Pennsylvania division, Pennsylvania Crusade, with related narrative on objectives of all elements of program in that area.

Iowa's quarterly—New Horizons

During the year the Iowa division was awarded a 1952 Cancer Crusade Citation by the national society for its magazine, New Horizons. This competent, illustrated quarterly is a program journal for the public which 4 times a year takes information on cancer to 200,000 readers in Iowa. A survey of readers by the University of Iowa indicates that 86 percent can name one or more symptoms of cancer.

Citation for the Alaska division

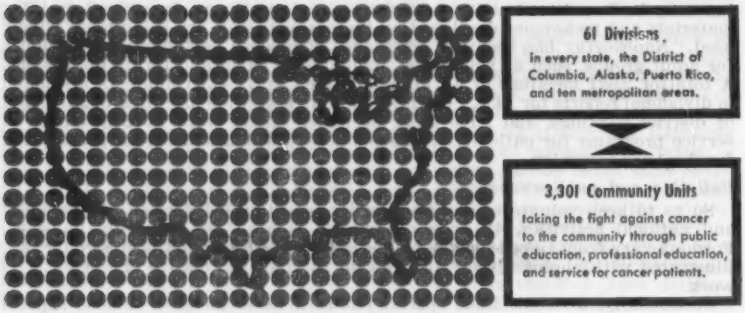
In 1952, the Alaska division, one of the newer divisions of the society, was awarded a crusade citation for its effective programs in public and professional education. In a remarkably short space of time the division was established, volunteers organized, and a control program initiated which has won the support of Alaska people as attested by regular oversubscription of the annual appeal quota. In 1952, the division raised 345.8 percent of its announced goal.

Loss of two great leaders

The society lost two of its great medical leaders in 1952 in the deaths of Dr. Louis C. Kress of New York and Dr. Thurman B. Rice of Indiana. Dr. Kress' death occurred a few days after he had been cited by his division and honored by Governor Thomas E. Dewey as "the man who had done most for the cause of cancer prevention and cure in the society's New York State division." Dr. Kress was a member of the national board of directors. Dr. Rice was regarded as the father of the Indiana division. He was head of the department of public health, Indiana University School of Medicine and author of many articles and books on health and medicine. At the time of his death, Dr. Rice was president of the Indiana division.

The April appeal

The 1952 crusade was one of the most successful yet conducted by the society. Outstanding details are discussed in a concluding section of this report. In a very high degree the success was due to the hard work of the divisions in organizing the crusade and the unflagging spirit, resourcefulness and drive of volunteers of the community units in its execution.


61 Divisions
in every state, the District of Columbia, Alaska, Puerto Rico, and ten metropolitan areas.
3,301 Community Units
taking the fight against cancer to the community through public education, professional education, and service for cancer patients.

THE UNITS FIGHT CANCER

Programs of the society reach their climax in the work of the units—in the home community. Here, the circle of activities which began in fund-raising in the community is brought back again in services of the units.

Within the community the ultimate target is the individual and the disease of cancer itself. Cancer will strike about 1 in every 5 of the population. It may strike at any time and who, when, and in what form cannot be foreseen. But as about half of those who will have cancer could be saved with present knowledge by early treatment, a basic aim of the unit is to try to make sure members of the community know enough about symptoms to seek a doctor's care when the cancer is still limited to its site of origin. The corollary step is help for doctors in detection, diagnosis, and treatment. Finally, is the problem of care for those with cancer, the patients. Half could be saved. But only one-quarter survive the disease today and thus many patients become chronically ill and are in varying degrees of medical and social want, depending upon their circumstances. Often whole families are financially engulfed before the disease has run its course. Within the units, these problems are immediate—urgent, personal, next-door.

The units and the volunteers

In 1952, under direction of the divisions, 3,301 organized units of the society were in active operation. Enrolled for programs conducted by this large number of organized units were about 1 million volunteer workers—the largest number engaged in the fight against cancer in any 1 year of the society's history. Approximately one-half were in permanent year-round programs conducted by the units in education for the public and services for persons suffering from cancer. The others joined their ranks in and around April in the work of the annual appeal. In 1952 about 18 percent of the volunteers were men.

Types of unit organization

Usually, the basic area served is a county, and the standard name the ——— county unit, ——— division, American Cancer Society. But sometimes district and township organizations are preferred. In metropolitan areas, a suburban or neighborhood or electoral district pattern may be employed. Units may be called branches or chapters.

The organization is flexible, developing more formal patterns with growth in programs. Many units operate through executive committees made up of doctors, hospital and health department representatives, and lay persons. Other units are controlled by boards of directors composed, as are the national and divisional boards, of representatives of the medical profession and laity. In 1952 there were 18,289 persons serving on unit boards of directors—6,203 were physicians or scientists and 12,086 were lay persons.

Unit headquarters

In the larger communities, permanent offices are sometimes maintained, serving as information centers for the public as well as headquarters for the unit. In other cases, the leader's home serves in both capacities. The leader is often known as the cancer lady, to whom everyone may turn for information.

As community programs develop over the years and greater funds become available, units in many areas find it advisable to strengthen their services by employing executive secretaries. Usually they have had training in health and adult education practices, medical social work, nursing, or community organization. They are especially needed in metropolitan areas where the caseload of cancer is heavy and the accompanying economic and social problems of patients are difficult of solution.

Unit service programs

Whatever its form and however the patient's difficulty has become known to the unit, the information center is the point where patients' problems are considered and discussed with the appropriate public agency. Such is the nature of cancer that each case generally presents a different problem. So as to conserve the society's resources, the units may make every effort to see that public means for assistance are used to their utmost. When weak or lacking, efforts are made to make good the deficiencies. Often, joint arrangements are made, the agency assuming a portion of the responsibility for the patient, the unit the remainder. In some areas the office of a county or city nurse, a welfare department, the office of the medical society, or in at least one instance, as in Puerto Rico, officers of home demonstration agents of the United States Department of Agriculture serve as information centers. In other areas, information services are maintained in conjunction with detection centers.

In Pennsylvania, 47 full-time information centers and 17 operated from homes of volunteer leaders serve the 67 counties of that area; 60,773 inquiries were received at these centers in 1952. Thirty-five formal centers are maintained in California, 25 in New York State, 22 in Illinois, 20 in South Carolina, 19 in Connecticut, 13 in New Jersey and Texas, 8 in Florida and West Virginia, and 5 in Wisconsin. Many other divisions maintain a number of full-time centers. In all unit areas, however, some form of organized information service is maintained to serve the needs of cancer patients in want and to supply information to the public.

Detection

A primary service to the patient is in the earlier detection of his disease. Unit detection programs have many forms depending on needs of the community and general policies of the divisions. If the detection center is an approved activity for the area, the unit backs its work with actions ranging from handling requests for examination appointments at information centers, to volunteers who serve as clinic receptionists, interviewers, etc., and in the maintenance of records. In doctor's office programs, the unit refers inquiries to doctors and is often the enabling agency for supporting services such as smear tests for early cancer of the cervix.

Several county units of the Indiana division provide free smear tests. The Marion County unit of the same division gives support to a cytology laboratory as do also the Erie and Lawrence County units of the Pennsylvania division. Free smear examinations are provided for medically indigent patients in several areas of Connecticut, parts of Ohio, in parts of New York City, and throughout New Jersey. The Mecklenburg County unit of the North Carolina division supports a cytology laboratory at Charlotte and a smear delivery service for physicians.

The Michigan division received one of the 1952 Crusade Citations for the establishment by 15 units of the Upper Peninsula district of a cytologic laboratory at Menomenee. The citation reads: "In building a regional cytology program, 15 ACS units have served their people well. By striking hard at cancer on one front, they have stimulated the whole cancer control movement in the Upper Peninsula."

Clinics and registries

Besides the financial support extended by the society, the units in many areas regularly support cancer diagnostic and treatment clinics in their community hospitals with a wide variety of voluntary services. Often, as in New Jersey, the clinic is an integral part of the entire service activity, the clinic secretary or medical social worker providing the unit with its day-by-day operating information on needs of indigent patients who have undergone treatment at the clinics. On this information may be largely based the unit's activities in transportation, nursing, and housekeeping assistance, the making of dressings, etc. Unit volunteers also assist in maintaining the all-important records of the incidence and mortality of cancer which to a large extent have their origin in

clinics. The Calhoun County unit of the Michigan division, at Battle Creek, maintains among other activities of the unit a community cancer registry which is a model of its kind.

Transportation

Regular examinations are a "must" for all patients who are being or who have been treated for cancer. Volunteers of the units usually employ their own automobiles to take patients in need to and from treatment centers. In some communities where the hospital must be reached by an overnight journey, expenses of the patient and an attendant, who may be a nurse or a volunteer, may be borne by the unit. Programs of this nature for patients in need are supported in Arizona, Idaho, Montana, and some other areas where distances are great or there is uneven geographic distribution of clinic facilities. In 1952, the Alaska division underwrote the expenses of a trip by a patient to a tumor clinic in the United States.

In some areas vehicles are owned by the divisions and their units, a roster of volunteer drivers being available on call. Four station wagons are operated by the New York City Cancer Committee, one a gift during the past year of the Advertising Club of New York. Another station wagon was presented by the Beta Sigma Phi sorority to the Logan County unit of the West Virginia division. Similar vehicles are operated by units of the Illinois division. In Maryland a motorcade organized by B'nai B'rith women is responsible for transportation. In South Carolina 1,029 trips were made in this essential service for patients who might otherwise have lacked proper treatment or attention for their disease.

Dressings

A service to provide dressings to patients in need is maintained as a program by practically all units. Volunteers, usually members of a club or church organization, meet in groups under supervision of a physician or nurse to cut and sew the dressings from contributed materials. The dressings are sterilized, packed, and turned over to unit headquarters to be delivered to patients through the transportation service. Sometimes bed jackets, bedpads, and other comfort articles are made as well. In 1952, the divisions report 4,751 groups of volunteer women produced 11,341,510 dressing for persons in unit areas suffering from cancer—a service of incalculable usefulness to doctors and nurses as well as to the patients themselves. Dressings for cancer patients may cost above $50 a month when purchaed.

Eighty-eight voluntary civic, social, and church groups participate in the dressings program of the Ramsey County unit, St. Paul, Minn. The unit has 17 places to which dressings are regularly supplied amongst individual patients, rest homes, and hospitals. The smallest organized village in Minnesota, Funkley (population 26) in Beltrami County, has a dressings program. Typical also are dressings groups of the women's auxiliary of American Legion Post No. 253 at Crystal City, Mo., and the Ladies' Aid Society of the Blue Hill Baptist Church, Blue Hill, Maine.

Nursing, home care, housekeeping aid

A variety of home services are offered by the units in assistance of needy cancer patients and members of their households. Foremost is nursing. As the service is professional, volunteers are employed only as aids after adequate training. The usual plan is a subsidy provided a public health agency of Visiting Nurses Association, enabling regular calls upon patients at a fixed charge per visit. In some areas, as has been noted, nurses are employed by the division to instruct public health and county nurses in the care of patients, the units making possible the regular visits of these specially prepared nurses to patients on their lists.

Through arrangements with the VNA in the State of Washington, 1,954 visits were made to 234 patients; in Milwaukee, 2,558 visits were made to 146 patients; in Philadelphia, 11,428 visits were made; while in California, 10,000 visits by VNA and other nurses were made to 4,715 patients. VNA service for needy cancer patients is available throughout New Jersey, in most areas of Connecticut through VNA and public health nursing agencies, in 39 counties in Pennsylvania. In all, nursing services for cancer patients were supported in cooperation with Visiting Nurses Associations in 1952 by 28 divisions and 9 other divisions gave support to similar arrangements with other nursing organizations. The Westchester, N. Y., division employs two nurses for clinic service and calls on patients.

Sometimes nursing services are supplemented by the employment of a practi-

cal nurse, of volunteers trained as nurses' aids or by coaching some member of the household in the care of the patient. The Nassau, N. Y., division has developed a notable program of this character. Often nursing services and home care activities are combined, the nurse limiting her work to supervision of daily routine and the more professional tasks. Twenty women have been trained and certified as cancer nurses' aides by the Jefferson County unit, Steubenville, Ohio, division.

Housekeeping assistance, another service of the units, may be provided by volunteers. The duties may include friendly visits with the patient, cooking, marketing, house cleaning, washing, care of the children, and even in some cases cleaning the walk and taking care of the furnace. The volunteers sustain the patient's courage and the well-being of the home through the period of illness.

Loan closets for patients

The commander of the Valley County unit of the Idaho division reports that after a patient had been supplied with a bed by the unit "the patient had a good night's rest, and all the family did, their first in quite a spell."

"Loan closets" as the collections of supplies and comfort articles are called, represent a most welcome service for patients. The materials, often contributed by individual donors, include sickroom necessities such as hospital beds, mattresses, sheets, pillowcases, rubber sheeting, wheelchairs, crutches, canes, bedpans, thermometers, ice bags, shaped cushions, feeding cups, etc., and comfort articles like bed gowns, fans, window screens, bedlamps, reading racks, toys, radios, phonographs and records, books, jigsaw puzzles. Many closets include materials for recreational and occupational therapy, as hand looms, knitting needles, and crochet hooks, paints and brushes, leather and woodcraft materials and tools, stamp kits, and albums. Sometimes a central depot for the more costly items is maintained by the division: The Illinois division, for example, has a supply of 100 hospital beds which are in constant use by units in that division. Nine hospital beds were in use "every day of the year" in Ohio. The closets are the centers from which bandages and dressings made by the volunteers are issued. In all, 812 closets were maintained by units in 1952.

Rehabilitation services

Persons who have been treated for cancer are sometimes left with handicaps to which adjustment is needed. If a rehabilitation service exists in the State, efforts are made to employ the facilities. Occasionally subsidies are offered these agencies but more often the action is direct. Notable in the past few years have been the classes, often conducted by former patients, for persons who must learn a means of speech after operations for cancer of the larynx. Many such groups exist in various areas today. New speech clinics are reported for 1952 from the southeastern Michigan division (Detroit), the Nassau (N. Y.) division, Indiana, Texas, and Delaware. Noteworthy was the first international convention for esophageal speakers held in August at Cleveland, Ohio, which was cosponsored by the Cuyahoga chapter of the Ohio division, the Cleveland Hearing and Speech Center, affiliated with Western Reserve University, the Cleveland Academy of Medicine, the Cleveland Otolaryngological Club, and the Ohio Bureau of Vocational Rehabilitation.

In Idaho and several other areas, former patients are helped in finding and keeping jobs. Former patients in South Carolina are aided in learning new trades. In North Carolina, a former patient is employed to train and give encouragement to colostomy patients. In Oregon, doctors and nurses have been supplied with the materials for exercises for mastectomy patients.

Medical care programs, loan funds

While it is not the policy of the society to pay doctor's fees, some provision is made in a number of divisional and unit areas to pay when no other source of funds is available for the drugs, medicines, and some of the treatment procedures needed by patients. Thus, in certain areas the costs of X-ray and radium treatments may be underwritten for patients in great need. Narcotics and the hormones employed in the palliative treatment of several forms of advanced cancer may be supplied. Prosthetic devices are sometimes furnished. Over the various areas, though a principle very hard to enforce when faced with dire need, such assistance is limited to an average maximum in very exceptional cases of about $200 per patient. In a few areas this difficult problem of medical expenses that are not included in the doctor's professional services is met by a small interest-free loan. So as to help patients in great need, 35

divisions maintained medical care programs of some nature in 1952 and 12 divisions reported loan-fund programs.

Unit public education programs

The year's accomplishments in education have been sketched in the sections of this report dealing with the divisions. It will be understood that the aggregate educational accomplishment of 1952 as measured in individuals reached, audiences for films, danger signal messages, and pamphlets distributed, etc., represent countless programs carried out by unit volunteers.

750 county and State fair programs

In 1952 the units participated in 750 county and State fair programs for which there was an estimated aggregate attendance of 3,116,887 persons and during which 2,111,070 leaflets carrying cancer's danger signals were distributed. These activities involved the construction of booths and their decoration with posters and other display materials of the society, the showing of films, talks by volunteer doctors, and conduct of information desks for the public. Groups of volunteers from the unit headquarters staffed the activities. A partial rollcall by divisions of fair programs conducted in 1952 is impressive: 65 programs were conducted at fairs in Arkansas, 55 in Iowa, 45 in Ohio, 42 in Michigan, 40 in North Dakota, 35 in New Jersey and Virginia, 31 in Indiana and Wisconsin, 27 in Texas, 25 in Kentucky, 20 in Colorado, 18 in Oklahoma.

Amongst noteworthy individual projects was the "Happiness House" exhibit prepared by the Southeastern Michigan division for the Michigan State Fair at which Man Alive! was shown to full houses 8 times daily over a period of 10 days. In New Mexico the division cooperated with four other voluntary health agencies in a joint exhibit at the New Mexico State Fair at Albuquerque. In Florida the Dade County unit (Miami) cosponsored a float which carried the society's message in the Orange Festival parade New Year's Day (1952), seen by tens of thousands of winter visitors. The Delta County unit (Michigan division) trained a group of housewives to act as film projectionists for a club and group program. They tried out their skill with great success at the Upper Peninsula State Fair before large audiences of Michigan people.

Theater film showings

Breast Self-Examination was designed for clubs, organizations, and for special groups of women. But one of the encouraging developments of the year was the larger audiences being reached in unit programs through presentations at off-hours in theaters and auditoriums to women without group affiliations. In addition, Man Alive!—the society's new film—was being widely shown in theaters as a popular feature of regular programs.

In California the Sacramento branch, among many other showings, arranged two showings for Breast Self-Examination in the civic auditorium, each well publicized in advance through department stores, beauty shops, etc. Panels of volunteer doctors were on hand to answer questions. Six thousand women attended the first meeting, 3,500 the second. In the same State the Kern County branch conducted a similar popular demonstration at the Harvey Auditorium in Bakersfield. In Philadelphia 6,000 women saw the film in 24 continuous showings at a special theater set up at the home show. In Ohio several theaters presented the film at special cancer matinees; in Canton over 4,000 women saw the film in 1 day. In Virginia 1 theater showed the film to audiences of women on 4 consecutive Saturday mornings. Morning presentations in Indiana proved highly effective. The RCA Exhibition Hall at Rockefeller Plaza, New York, shows the film the first Thursday and second Wednesday of each month.

Man Alive! enjoyed high popularity as a theater feature. The San Francisco branch, California division, arranged showings in many first-run and neighborhood theaters in San Francisco and nearby towns. In Pittsburgh the picture was shown in two downtown theaters and community theaters of surrounding Allegheny County. In Illinois the film was shown in 58 theaters in 19 counties, running 3 days in each theater. Prints were donated by the Illinois Women's Golf Association. The units promoted the showings through lobby displays and other activities. At Pocatello, Idaho, the Bannock County unit arranged showings in three theaters.

Business and industry programs; labor-union aid; military installations

Educational programs were carried out in many units for General Electric, General Motors, and Bell Telephone System employees. Noteworthy was a program for loggers at a lumber camp in the Potlatch National Forest, Idaho; a

program of the Forsyth County unit of the North Carolina division for banking and insurance company employees at Winston-Salem; and programs in the District of Columbia for thousands of employees of Government agencies.

Labor organizations have been very active in business and industry programs. In some unit areas joint labor-management committees supervise the programs. Labor cooperation has been highly effective in Michigan, Minnesota, and Mississippi. Unions with large numbers of women workers have been active in breast self-examination programs, especially Amalgamated Clothing and ILGWU locals.

At military installations programs were given at Tinker Field, Okla., reaching 24,000 servicemen and at Hill Air Base, Utah, for 13,000. A breast self-examination program was conducted at Sheppard Air Base, Tex., for the wives of service personnel. Man Alive! was projected during the April crusade for 30,000 servicemen at the Great Lakes Naval Training Station, Great Lakes, Ill. The society's radio series, Music America Loves, carrying the society's message, was broadcast in full to 18,000 employees of the Brooklyn Navy Yard over the public-address system. Seventy-two sessions, involving talks or showings of films, were conducted for employees of the Marine Supply Depot at Philadelphia. The Maine and New Hampshire divisions combined in a program at the Portsmouth Navy Yard.

Many audiences, many channels

A few examples—programs on Indian reservations in Iowa and Texas; programs for the blind in Brooklyn; a crusade educational program conducted with the help of Eskimos at America's "farthest north," Point Barrow, Alaska; a "woman on horseback" who crusaded in New Jersey; a benefit concert by the Montana Prison Band; a story of a former patient who had been helped by the McKeon County unit, Pennsylvania division, won in an essay contest sponsored by the Julius Mathews Agency of New York; educational programs in 11 public-housing projects in Brooklyn; a display of cancer costumes for fashion editors in the District of Columbia—depicting surgeon, radiologist, nurse, the volunteer; a cancer warning on the marquees of drive-in theaters in southern Illinois; cancer literature distributed through comfort stations of the Seaside Oil Co., Santa Barbara, Calif.; "Welcome Wagon" cancer leaflets for new arrivals in Westchester County (N. Y.) and New Mexico.

The Cedar Rapids, Iowa, celebration

One of the outstanding educational events of the year was the Thanksgiving celebration held in April at Cedar Rapids, Iowa, sponsored by the Linn County unit. Here the 70,000 citizens of Cedar Rapids celebrated the fact that about the same number of people as their total population had been saved from cancer in the United States in the past year. Colorful ceremonies marked the event.

Amongst many activities were special church services, displays in shop windows prepared by volunteers, high-school programs including an essay contest, and a municipal parade witnessed by 25,000, led by bands and 12 Cancer Crusaders clad in armor and mounted on matched Palomino horses. A dinner attended by 173 persons who had been cured of cancer climaxed the celebration. The event was carried over the Columbia Broadcasting System television network as an offering of See It Now, Edward R. Murrow's national telecast.

1952 Unit Cancer Crusade citations

Crusade citations are made not alone to honor exceptional accomplishments, but to call attention throughout the society to programs which may be advantageously developed in other areas. Besides the citation already mentioned to 15 units of the upper peninsula district of Michigan for their notable program in support of a cytology laboratory, units in Florida, Pennsylvania, and South Carolina were honored in 1952.

Allegheny County unit, Pennsylvania

The unit, with headquarters in Pittsburgh, was cited for its Survey of Public Knowledge About Cancer, conducted by volunteers in 1951 with the cooperation of the American Institute of Public Opinion (Gallup poll) and the national office staff. The survey was a combined educational and factfinding program.

The citation reads: "Volunteers used professional methods to carry out an educational project that provided guiding data for future programs. Public opinion studies are important weapons against cancer."

Duval County unit, Florida

The citation was made for a well-developed general cancer control program serving the people of Jacksonville and surrounding Duval County. Continuing year-round education is conducted through civic organizations. The film Breast Self-Examination has been widely shown to groups and in theaters. A school program has reached high school students over a 4-year period. An information center is maintained which also houses a loan closet. Articles for patients are donated by church and civic groups; dressings, made by women of church organizations. A nursing service for indigent patients is maintained through the Visiting Nurses Association; transportation, housekeeping, and child care programs conducted. In cooperation with the Duval County and State boards of health, a hospital cancer clinic is supported, served by volunteer doctors and volunteer aides. The unit instituted in 1947 the First Annual Southeastern States Cancer Seminar for doctors and was host again in 1950 for a large group of doctors assembled for the meeting. A nursing institute was conducted in April. In the 1952 campaign the unit attained 123 percent of its goal.

Union County unit, South Carolina

The Union County unit citation honors a notable all-round program. The unit serves a medium-sized county of the State, with a largely rural population of 31,529. Educational data reaches every home in the county. Breast Self-Examination has been widely shown to women. All women are urged to have regular examinations—a large percentage regularly visit the detection clinic or are examined by their own physicians. A chest X-ray program in cooperation with the State board of health has been started. A speakers' bureau of volunteer doctors and nurses is maintained. From One Cell and The Traitor Within have been shown in each of the high schools. Newspapers and radio stations cooperate vigorously. Each year an exhibit is presented at the Union County Fair, staffed by unit volunteers. Indigent patients are helped with a service program which includes nursing care, transportation, the provision of drugs, loan closet supplies, dressings made by local groups of women. Thus the people of Union County have become "cancer conscious" and generously support the cancer crusade with their contributions. In 1952, Union County contributions were 220.7 percent of quota, supporting an even stronger program in 1953.

RESEARCH

Again, in 1952, the society assigned a far greater proportion of its resources to research than any other major voluntary health organization. Since 1945 the society has allocated nearly $25 million of the funds contributed by the public to research, and to train the manpower needed to sustain research in the years ahead. What has been accomplished?

The ultimate research goal is to discover the basic nature of cancer in man—to establish means for preventing cancer, or for curing it readily if it strikes. Progress has been slow but steady. Each year has seen a broadening accretion of basic facts about the growth process, normal and abnormal.

We know this ultimate goal still lies ahead—just how far is impossible to say. But we ask the practical question, a question that can be answered specifically. What can be done today for the cancer victim that could not be done before the national research attack on cancer was launched? Recent authoritative statements given in testimony before congressional committees during the year and in papers at the society's annual meeting point to some of the answers.

Surgery, radiation—still the only cures

Surgery and irradiation are still the only recognized cures for cancer. But cure rates of certain types of cancer treated by surgery have been significantly improved through advances in cancer surgery techniques. Cancer surgery has become bolder, more extensive. Besides removing malignant tissues and adjacent lymph nodes, surgeons today often find it possible to the great advantage of the patient to remove adjoining organs and tissues that are frequent sites of extension. Inhibition of tumor growth, through alteration of hormone balance by surgical removal of endocrine glands, is another example of useful cancer surgery. Cancer can often actually be prevented surgically by the removal of certain benign growths, such as intestinal polyps, which may become malignant in time.

Important new methods in surgery have raised some cancer cure rates. Control of hemorrhage, control of secondary infection by antibiotics, better anaes-

thesia, control of body chemistry and other advances in surgical techniques have considerably raised the probability of favorable outcome for cancer operations.

In radiation treatment of cancer, the development of new and more powerful radiation sources, through advances in physics and engineering, have vastly enhanced its effectiveness. Supervoltage X-ray generators operate in therapy at several million volts with promising results. The betatron and other particle accelerators provide new types of radiation at voltages as high as 350 millions—soon to reach a billion volts. In addition to more powerful irradiation, ingenious improvements have been made in methods for applying radiation. For example, rotational therapy, in which the patient is fastened in a chair and slowly rotated underneath an X-ray beam, makes it possible to pin the radiation on the cancer with minimal harm to neighboring tissues.

Radioactive isotopes, widely available only since research on atomic energy has reached its full stride, have now made it possible to apply radiation therapy with particular advantage to certain malignant conditions formerly difficult of approach. Radioactive iodine is valuable against cancer of the thyroid gland. Radioctive phosphorus is useful gainst chronic leukemia, and against another malignant condition of the blood stream called polycythemia. It has been possible, indeed, to keep polycythemia patients alive and vigorous for their normal life span through treatment with radioactive phosphorus and sodium. Both radioactive iodine and radioactive phosphorus have practical value also in the localization of brain tumors and make possible their removal with improved precision.

Skillful and resourceful combinations of surgery and radiation are today making possible cures of cancers that could not in the past have been effectively treated by either method alone.

Chemotherapy of cancer

Although the use of chemicals against cancer—so-called cancer chemotherapy—is not established as a cancer cure, certain chemicals have been found to have ancillary value when used with irradiation. Perhaps even more important, certain chemicals have proved value in the palliation of incurable cancers, permitting the victims of some types of cancer to survive for extended periods in comfort and with sufficient vigor to lead productive lives.

Materials now effectively used in the chemical treatment of cancer—either alone or in combination with other treatments—include hormones, nitrogen mustard, triethylenemelanine (TEM), triethylenephosphoramide and folic acid antagonists. Cancerous conditions that have been benefited with such chemicals, although not cured, include Hodgkin's disease, chronic leukemia, acute leukemia in children, lymphosarcoma, neuroblastomas, embryoma of the kidney, certain brain tumors, some cancers of the breast, of the lung, of the bladder, and of the prostate gland.

Before 1947 a child who fell prey to acute leukemia usually survived less than a year. There is still no cure. But today, with skilled application of the folic acid antagonists, 30–50 percent of children with acute leukemia enjoy almost complete remission of symptoms for worthwhile periods of time. Treatment by such means of one group of almost 400 children produced relief and increase in the survival period of approximately two-thirds. One child lived almost 4 years after the onset of acute leukemia, and another is alive today after more than 3 years.

Chemotherapy survey

Chemotherapy has been so effective against other diseases, and results in cancer treatment so promising, that the society in 1952 visited the leading investigators and laboratories in the field to see how the chemotherapy research program might be enlarged and made more effective. Pharmaceutical concerns were approached and gave assurances of their wholehearted cooperation. Industrial concerns of America have helped to fight cancer—many of the compounds tested for effectiveness against cancer are of industrial origin. A report on the survey, received in December 1952, indicates several promising courses of action for the society to follow in 1953.

Fighting for small percentages

Perspective on the avenues of progress in cancer research was provided by Dr. Paul E. Steiner, president of the American Association for Cancer Research, in his presidential address at the 1952 annual meeting of the association in New York in April, Dr. Steiner said: "Progress in the past has been slow in human cancer, as in tuberculosis and some other diseases, but it has been steady. Decade by decade things get better. Progress has consisted of eroding away

a few percent from the mortality of one kind of tumor this year and a few percent from another type at a later time. The sum of these small victories adds up to the impressive figures totaled for some cancers. Progress of this type can be expected to continue. It is slower than we would like, but it is acceptable, since it could eventually infiltrate and eliminate the mortality problem. This solid progress in no way precludes the possibility of sudden, dramatic advances.

"* * * To the initiate, progress in terms of a few percent is apparent; to the others it is not. We are fighting for small percentages in each type of cancer and are grateful for the sum of numerous small conquests. Decade by decade they add up to perceptible, if not entirely satisfactory sums."

Growth in cancer research support

The specific steps of laboratory progress, while important, do not give the complete picture of the massive growth in cancer research of the postwar years. Development has been in two areas: First, there has been a vast expansion of laboratory facilities across the country, aided by the training of hundreds of scientists to man them; and second, a more intangible change, there has been a shift in viewpoint among researchers from pessimism to a reasoned optimism.

Since its reorganization in 1945, the society has assumed a leading position in supporting and stimulating cancer research in this country. Up to that time too little had been done to give scientists the tools, the encouragement, and the financial support they needed to launch into cancer research. Before the war, the number of determined senior investigators in the cancer field was severely limited—they were numbered in dozens, not hundreds. Great work had been done by brilliant and resourceful men and women, but among scientists in general the attitude toward cancer was gloomy and young men were reluctant to enter a field that seemed to offer so little promise. Scientists used to say with a bitter smile that cancer laboratories ought to have a sign reading "Abandon hope all you who enter here."

TABLE 1.—*Summary of the society's research program—1945–52*

1945 campaign	$979,047.42	1950 campaign	$3,476,013.63
1946 campaign	2,503,934.50	1951 campaign	3,739,937.84
1947 campaign	2,996,714.44	1952 campaign	4,109,546.32
1948 campaign	3,297,973.03		
1949 campaign	3,471,427.41	Total 1945–52	24,574,594.43

The society's research program has three major parts:

(*a*) *Grants-in-aid.*—Awarded to universities and scientific institutions for specific research projects under designated investigators.

(*b*) *Institutional research grants.*—Awarded to research institutions for coordinated programs conducted by groups of investigators.

(*c*) *Research fellowships and scholar grants.*—Fellowships are awarded to specific individuals undergoing training in designated institutions—scholar grants are awarded to institutions for advanced training of designated individuals.

The research funds have been allocated to these categories, as follows:

(*a*) Grants-in-aid	$12,204,887.72
(*b*) Institutional research grants	10,312,715.16
(*c*) Fellowships and scholar grants	2,056,991.55
Total 1945–52	24,574,594.43

Informal studies indicate that not more than a million dollars a year was available from all sources for cancer research before 1941. Today the figure ranges above $15 million annually. Approximately 1,800 first-rate scientists are now devoting much of their time and thought to cancer research. A good share of their work is in new laboratories, constructed since 1945.

To explain the change in the climate of opinion that surrounds a vital research problem, such as cancer, is never easy; but it does seem clear that the society has been a major factor in the development of a more positive and hopeful approach. Today the difficulty is to decide what research to select for support from the many who apply for grants and fellowships; there is not now nearly enough money to meet the requests. A few years ago—in 1946 and even in 1947—the problem was different. Then, the society had to persuade institutions and scientists to undertake cancer research; interest had to be aroused in students; assurance had to be given that financial support would not in a year or two wither away. Of fundamental importance were the annual crusades of the society, fund-

raising and educational, which provided money for research, stirred public interest, gave direction and hope to the entire attack on cancer.

When it was clear that voluntary contributions would not be enough to underwrite the total research attack, the society joined others in urging larger appropriations for the National Cancer Institute. Although not all that was needed has been voted, the Congress has shown a remarkable and constantly increasing understanding of the cancer problem.

Today cancer research is supported principally from four sources: Private funds, the Government, public contributions, and by funds of universities, hospitals, and other institutions conducting cancer research. In the total picture, the society has played a major role, both in the research that the society itself supports and in its influence on the programs of other agencies. Table I shows that since the society's reorganization in 1945 it has allocated nearly $25 million for research. This table also explains the types of research grants made by the society. Table II shows in detail the society's 1952–53 research program.

The committee on growth

The society's scientific adviser on research, the committee on growth, was established in 1945 as an operating unit of the National Research Council through contract between the society and the National Academy of Sciences. The committee maintains a small, highly competent full-time staff at National Research Council headquarters in Washington, D. C. The heart of the operation, however, is the committee itself and its advisory panels, comprising over 100 of the country's leading scientists. These scientists contribute their knowledge to the society; they receive no compensation. In 1952 the committee and its panels had to consider in detail 337 applications, comprising 2,246 pages of typewritten text. Nor are services of the committee limited to consideration of written applications, for often committee or panel members, or staff personnel, pay visits to institutions applying for or having society research grants.

It will be seen that deliberations of the committee and its panels concerning applications for research grants provide the society with a machinery for the constant evaluation of research progress. As projects and fields of inquiry are reviewed and studied year by year, decisions of the committee give impetus and encouragement to those of the greatest scientific promise. Thus the program as a whole is kept in step with broad advances in scientific knowledge, and its many parts related to each other in a coherent, carefully judged manner.

The entire research training program of the society—fellowships and scholar grants—is based upon committee on growth recommendations. Such training is one of the society's basic contributions to research; for through it new ideas, and the vigor of new investigators, are constantly added to the cancer field—and future generations of cancer scientists provided. These fellowships are in addition to the society's medical fellowships, referred to earlier. In 1952, upon recommendation of the committee, the society awarded 73 research fellowships and research scholar grants, totaling $272,600. Since the start in 1946 of the society's research fellowships program, 376 fellowships and scholar grants have been awarded, totaling $2,056,992.

The grants-in-aid approach

In table II, those sections of the society's research program awarded under recommendation of the committee on growth are shown in the columns indicating grants-in-aid, research fellowships, and research scholar grants. This program represents about half of the research dollars annually granted by the society. Although administratively each grant-in-aid is handled as a separate project, the individual studies as a rule are parts of substantial cancer-research programs carried on within the various institutions. In 1952, the society awarded 262 grants-in-aid to 101 institutions, totaling $1,713,363. Since the start of the program in 1946, 1,455 grants have been made totaling $12,204,888.

Following are typical examples, from various sections of the country, of cancer research made possible by the society's grants-in-aid program:

Skin cancer: At the University of Oregon, in Portland, four different research groups are pursuing cancer studies, under grants from the society and other agencies. One of the Oregon scientists for over 5 years has been studying melanomas—pigmented cancers that occur in human beings and animals. He has found that the pituitary gland regulates activity of the pigment-producing cells that give rise to melanomas. The scientist and his coworkers have identified a specific hormone in human pituitary glands that stimulates the pigment cells. The Oregon group is now engaged in purifying the hormone. so that its precise role in normal and abnormal functioning of the pigment cells may be clarified.

On the diagnostic side, it has been found in the Oregon work that an enzyme—tyrosinase—may be an index of malignancy in pigmented tumors. Laboratory tests are now being devised to apply this relationship as a diagnostic tool. The tyrosinase findings next led to a possible application in therapy. It has been discovered that factors in the blood stream called immune bodies appear to attach to tyrosinase in melanomas. The observation has stimulated work to see whether immune bodies can be used to carry drugs selectively to melanomas, for the treatment of the tumors.

Food and cancer: In studies of animal cancers, food intake has sometimes been found to have profound effects. These observations are paradoxical, however. While undernourishment may prevent cancers, it may also stimulate them. The possible role of nutrition in human cancer is even less well understood. Hence there is great need for basic information on the effects on cancers of nutritive factors in foods.

At the Alabama Polytechnic Institute, at Auburn, scientists are studying the effect of nutrition on cancers in animals. The phase of this work supported by the society is now entering its seventh year, and has yielded much valuable information. To take one example, it has been found that when the rations of dogs, rats, or chickens are low in the vitamin choline the animals are more apt to develop cancers than when their diets contain greater amounts of choline. Unfortunately, diet factors rarely operate individually but in relation to numerous other food factors. The work is now aimed, therefore, toward finding the relationship of other vitamins and of protein factors in the animal's rations to cancers caused by choline deficiency.

Hormones: Stanford University, in California, has a large and productive cancer-research program, with 20 different projects receiving grants from the society and other agencies. At the school of medicine of this university, cancer studies with golden hamsters have revealed that when a particular sex hormone is administered, the animals develop kidney cancers. The cancers otherwise never appear. In addition to producing cancers by such means, the scientists have found procedures, involving other hormones, whereby cancers in these animals may even be cured after they have developed.

How the Committee on Growth operates: The Committee is composed of twenty eminent scientists who are advised by about 100 other scientists organized into sections and panels, each representative of a scientific area in cancer research. Applications for the Society's grants-in-aid and fellowships are first carefully studied by the panels, are evaluated by the executive committee and finally recommended by the entire Committee to the Society.

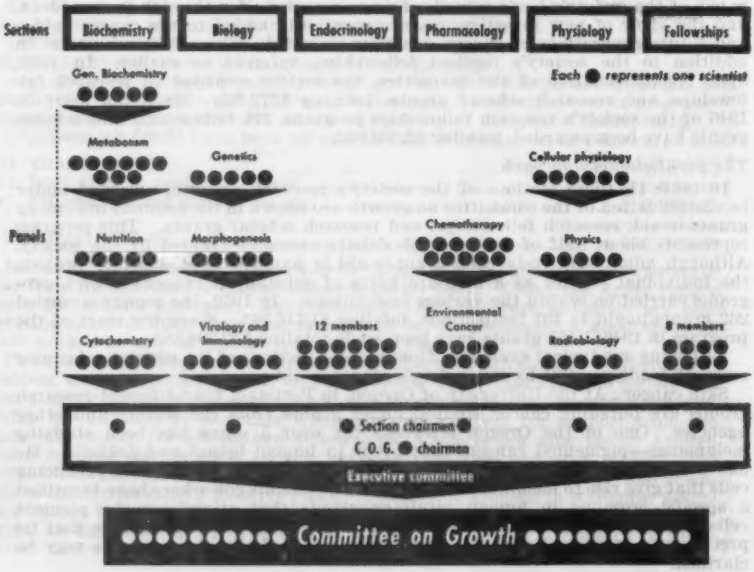


TABLE II.—*Distribution of research funds American Cancer Society 1952–53 program*

	Grants-in-aid	Fellowships and scholar grants	Institutional research grants	Total funds [1]
Alabama Polytechnic Institute	X			$12,000
American Museum of Natural History, New York	X	X		1,000
Amherst College, Massachusetts	X			6,000
University of Arkansas	X			9,360
Baylor University, Texas	X			6,000
Boston Dispensary, Massachusetts	X			6,700
Boston University, Massachusetts	X		X	21,500
Brown University, Rhode Island	X		X	17,162
University of Buffalo, New York	X			[2]
California Institute of Technology	X	X		14,500
University of California	X	X	X	122,520
Carnegie Institution of Washington, Maryland, and New York	X			7,400
Cedars of Lebanon Hospital, California	X			5,000
University of Chicago, Illinois	X	X	X	258,884
Colorado A & M College	X			4,000
University of Colorado	X		X	42,492
Columbia University, New York	X	X	X	224,918
Connecticut College	X			6,000
University of Connecticut	X			8,000
Cornell University, New York	X		X	93,664
Detroit Institute of Cancer Research, Michigan	X		X	55,000
Duke University, North Carolina	X	X		25,756
Albert Einstein Medical Center, Pennsylvania	X			6,000
Emory University, Georgia	X	X	X	16,750
George Washington University, District of Columbia	X		X	27,000
Hahnemann Medical College and Hospital, Pennsylvania	X			4,950
Harvard University, Massachusetts	X	X	X	163,376
University of Illinois	X			59,269
Illinois Institute of Technology	X			2,500
Indiana University Foundation	X			30,000
Institute for Cancer Research, Pennsylvania	X	X	X	188,500
State University of Iowa	X			5,000
Jackson Memorial Laboratory, Maine	X	X	X	92,152
Johns Hopkins University, Maryland	X	X	X	69,644
Kansas State College	X			5,100
University of Kansas		X	X	27,000
Louisiana State University	X			4,000
University of Louisville, Kentucky	X			3,000
Loyola University, Indiana	X			4,750
McLean Hospital, Massachusetts		X		
Marine Biological Laboratory, Massachusetts	X			1,000
Marquette University, Wisconsin	X			31,100
Massachusetts General Hospital	X	X	X	124,000
Massachusetts Institute of Technology	X	X		10,400
University of Miami, Florida	X			9,000
Memorial Center for Cancer and Allied Diseases, New York	X	X	X	307,000
Michael Reese Hospital, Illinois	X	X		8,500
Michigan State College	X			[3]
University of Michigan	X		X	21,512
University of Minnesota	X		X	87,725
University of Missouri	X			[3]
Mount Zion Hospital, California	X			7,400
Nassau Hospital, New York	X			1,000
National Academy of Sciences, District of Columbia	X		X	162,166
New England Center Hospital, Massachusetts	X			9,252
New York Medical College, New York	X			4,000
Research Foundation of the State University of New York	X			25,752
New York University, New York	X	X	X	83,166
University of North Carolina	X			5,816
University of Notre Dame, Indiana	X			2,500
Oglethorpe University, Georgia	X			4,860
Ohio State University		X	X	10,000
Oklahoma Medical Research Institute			X	25,000
University of Oklahoma	X			4,940
Oregon State College	X			4,000
University of Oregon	X			4,750
University of Pennsylvania	X	X	X	58,000
Peter Bent Brigham Hospital, Massachusetts	X			5,000
University of Pittsburgh, Pa	X			17,550
Polaroid Corp., Massachusetts			X	5,000
Polytechnic Institute of Brooklyn, N. Y	X			[2]
Princeton University, New Jersey	X			9,000
Purdue University, Indiana		X		
Rees-Stealy Clinical Research Foundation, California	X			5,000
University of Rhode Island	X			2,540
University of Rochester, N. Y	X	X	X	23,132
Rutgers University, New Jersey	X		X	32,722
St. Louis University, Missouri	X			5,130
Siena Heights College, Michigan	X			567

[1] Exclusive of fellowships.
[2] Extended time.

TABLE II.—*Distribution of research funds American Cancer Society 1952–53 program*—Continued

	Grants-in-aid	Fellowships and scholar grants	Institutional research grants	Total funds [1]
Society for the Study of Development and Growth, New York	X			$1,000
University of Southern California	X		X	13,504
Southern Illinois University	X			4,000
Southern Research Institute, Alabama	X		X	87,331
Stanford University, California	X	X	X	62,959
University of Tennessee	X			24,424
University of Texas	X		X	94,903
Trudeau Foundation, New York	X			13,618
Tufts College, Massachusetts	X		X	63,578
Tulane University, Louisiana	X	X	X	63,412
Tuskegee Institute, Alabama	X			3,500
University of Utah	X	X		20,520
Utah State Agricultural College	X			2,484
University of Vermont	X			5,000
Medical College of Virginia	X		X	22,700
Wake Forest College, North Carolina	X			3,200
Waldemar Medical Research Foundation, New York	X			4,892
State College of Washington	X			2,950
Washington University, Missouri	X	X	X	43,556
University of Washington	X	X		20,468
Western Reserve University, Ohio	X	X		72,044
University of Wisconsin	X	X	X	85,246
Worcester Foundation for Experimental Biology, Massachusetts			X	16,000
Yale University, Connecticut	X	X	X	98,167
FOREIGN				
Cambridge University, England		X		
Carlsberg Laboratories, Denmark		X		
University of Copenhagen, Denmark		X		
Eidgenossische Technische Hochschule, Switzerland		X		
Hammersmith Hospital, England		X		
McGill University, Canada		X		
Royal Cancer Hospital, England		X		
The University, England		X		
Total [1]				3,604,747
Fellowships				266,601
Grand total	272	62	40	[2] 3,871,348

[1] Exclusive of fellowships.
[2] As committed, Dec. 31, 1952.

Recently, the same group has found how development of the tumors may be prevented, even though the sex hormone has been given to the animal. Prevention is by X-ray irradiation of the pituitary after the sex hormone has been administered but before the kidney cancers develop.

Tissue culture: Cancer research of the University of Texas is conducted at three locations; Austin, Galveston, and Houston. At the medical branch of the university in Galveston, research utilizes one of the most remarkable tools of modern biology, tissue culture. Bits of tissue from animals, plants, or humans are kept alive and vigorously growing for a long time in laboratory glassware. In such cultures the cancers can be studied intensively and compared with the normal tissues, more readily than in the human body. Here chemicals are studied that cause cancers, as well as those having possible value in curing them.

Recently, a Texas scientist has succeeded in growing in tissue culture cells that have been "exfoliated" or sloughed off from their site in the body. Examination of exfoliated cells has recently become one of the precision weapons in cancer control, by making possible the very early detection of cancer. Another advance has been the making of time lapse motion pictures of tissue cultures. These motion pictures reveal secrets of the cell, such as movement of the nucleus, that have never been penetrated before.

How cancer spreads: At the University of Chicago is located the Nathan Goldblatt Memorial Hospital for neoplastic diseases, the Argonne Center Research Hospital, and also the Ben May Laboratory for cancer research. In addition, cancer research is conducted throughout the university. In all there are 25

different research projects. A research group in the department of zoology is studying "morphogenesis"—the establishment of form and differentiation of tissues during development of the embryo. Since cancer represents loss of the differentiation in tissues more knowledge of morphogenesis is needed. The scientists isolated single cells from tissues of normal embryos, and injected the normal cells into the veins of other embryos. They observed that the cells circulate in the blood stream until they reach the very same tissue from which they were originally isolated; there they attach and grow. This is quite the reverse of the "metastases" of cancer. For in cancer, where the power of differentiation has been lost, the cells break free, enter the blood stream and attach anywhere in the body. This spread of cancer and continued growth in distant parts of the body is one of the most baffling aspects of the disease. The Chicago studies cast more light on the normal growth processes and help us to understand the abnormal growth of cancer.

The institutional grants approach

Approximately half the society's research funds are allocated as project grants through recommendations of the committee on growth; the balance is allocated as institutional research grants. These are a relatively new type of research support, pioneered by the society in 1947, 2 years after its large scale research program was launched. The grants are substantial allocations to institutions, in support of research directed toward the cause and control of cancer in man, designed to foster investigative opportunity and productivity beyond that possible by isolated workers or individual disciplines. In general, an institutional grant supports a program while a grant-in-aid helps a particular scientist working on a specific project. In 1952, the society awarded 31 institutional research grants, totaling $1,979,379. Since the start of the program in 1947, 173 institutional grants have been awarded, totaling $10,312,715.

How institutional grants work

The special values of the society's institutional research grants may be seen from the experience of Harvard University where one of these grants is now in its 5th year. Excellent cancer research has, to be sure, been underway at this institution for years. Here the world famous Huntington Laboratories are exclusively devoted to cancer, and research in the disease is also conducted by investigators in the medical school, in the teaching hospitals, the dental school, the school of public health, the liberal arts college—throughout the diverse branches of the university.

Much of the cancer research at Harvard was, and still is, financed through grants-in-aid. But the institutional research grant provided a new means for integration of the cancer work, and for promoting communication among the investigators. Under a committee on research and development in medicine and health, a university committee on cancer research and training, with advisory panels, supervises the program. The committee each year considers proposals from investigators within the university for research that they would like to undertake or extend under the society's institutional grant. To build a balanced program, special emphasis is placed on the development of new areas in research, and on the encouragement of young scientists just entering the field.

A program in action

The current Harvard program has a broad sweep, extending from laboratory bench to patient. At times public health and cancer prevention projects have been included. At present, in the medical school, studies are conducted of chemicals that may cause cancer, and also of viruses that produce tumors in animals. Extensive research on relationships of hormones to cancer is current, some of it using monkeys, an expensive but particularly valuable experimental animal for such work. Biochemical studies include research on the regulation of growth by vitamins, on enzymes as related to cancer, and on composition of normal and malignant cells using "cytochemistry," a new technique that enables chemical exploration of the intact cell.

In the clinical field, the Harvard program includes studies of overproduction by the skin of the tough surface layer known as keratin, a condition which may precede skin cancer. Other clinical studies cover liver function in patients who have undergone extensive cancer surgery, studies of chromium as a cause of lung cancer and study, with human subjects, on mineral substances called

trace elements that have important physiological effects although present in only minute amounts.

In the liberal arts college at Harvard studies are being made of growth and differentiation using the glands of insects. There is also a chemistry program, invloving research on production of hormones within the body, the laboratory synthesis of chemical compounds related to hormones, and observations of how proteins are manufactured by the body during normal and abnormal growth.

Research under institutional grants

The integration achieved in a great university has been suggested in the sketch of activities at Harvard. Different is the specialized cancer research institute, where all work is done, so to speak, under one roof. A notable example is the great Sloan-Kettering Institute, of Memorial Center for Cancer and Allied Diseases in New York City. Here, among many other research activities, is the largest program in the world for screening materials for possible chemotherapeutic effectiveness against cancer. About 16,000 substances have been tested thus far; over 200 have shown promise in studies with animals and about 12 have been found definitely helpful with human beings. Pioneer experiments with viruses are being carried out. Also under way is a unique and productive study of hormones.

Research findings at Sloan-Kettering Institute are applied as promptly as the step can be justified in the treatment of patients at Memorial Hospital and the James Ewing Hospital of the City of New York, the major clinical institutions of Memorial Center. Thus the antifolic compounds, TEM, ACTH, and cortisone after searching study have been taken from the laboratory to help patients suffering from leukemia and other cancers of the blood-forming tissues. Similarly, synthetic hormonelike chemicals have been applied, after thorough testing in experimental animals, in the palliation of advanced breast cancer. Encouraging results have been obtained likewise in some advanced cases of breast cancer by combining irradiation and hormone treatments, in part a result of the institute's study of hormones. The institute is a teaching division of Cornell University Medical College as well as a research center. The permanent staff numbers over 100 scientists and research physicians, aided by more than 200 research assistants and technicians. About 40 research fellows carry out special studies each year under the direction of senior staff members.

Cell surgery.—Another example of an institutional program of cancer research is the program of the Institute for Cancer Research at Philadelphia. Here, one member of the staff uses frog eggs as a convenient laboratory tool in which to observe development of the embryo. Through group action the Philadelphia workers have made an extraordinary technical achievement in transplanting the living nucleus from one cell to another. Until recently such radical surgery on the minute cell was considered impossible. However, these workers can now transfer a nucleus from embryos that have partly developed to undeveloped eggs whose nuclei have been removed. In this way they may learn to what extent differentiation of the embryo depends upon the nucleus of the cell, to what extent upon the remaining cell structure.

Transplanted tumors.—At Yale University, New Haven, Conn., a society institutional research grant helps to maintain a colony of laboratory animals used by several cancer investigators in the university. One has been doing some remarkable experiments in the transplantation of human cancers to laboratory animals. Although moving tumors from one animal to another of the same species is a routine laboratory procedure, it is ordinarily quite difficult to move them from one species to another. The scientist and his coworkers have, however, developed means whereby some human cancers may be transplanted to small laboratory animals, such as mice or guinea pigs. Other human cancers, to the contrary, resist efforts to get them to grow in animals.

When the scientists compared their experience in transplanting human tumors to animals with the fate of each individual patient from whom the cancers were taken, they made a dramatic observation. Those patients whose cancers could be successfully transferred to animals quickly succumbed, even though given the best medical treatment. On the other hand, many patients whose cancers resisted transplantation are still surviving. When the basic reasons for this difference in tumor response have been discovered, the world should have a better knowledge of tumor behavior. Here may be an important avenue for further investigation.

Radioactive albumin.—At the University of Minnesota in Minneapolis, doctors in the division of neurosurgery are using radioactive isotopes to locate and diagnose brain cancer. The Minnesota scientists do this by giving the patient human

serum albumin treated with radioactive iodine. This material concentrates in the tumor and may be located by use of such instruments of modern atomic physics as the Gieger counter.

Institutional research policy

A year ago the society appointed an institutional grants policy advisory committee of six representatives of institutions that have received institutional research grants. These men thus have a practical knowledge of the program. The chairman of the committee on growth and the director of the National Cancer Institute serve ex officio on this committee, providing necessary liaison. The group is concerned with policy recommendations only, not with allocations of funds. The committee has endorsed in general the operating policies which the society has developed for awarding and administration of institutional research grants, but has recommended one significant change in policy, relating to conditions of eligibility. The society had been accustomed to restrict grants to institutions having medical school or hospital affiliations. The committee recommended that the stricture no longer applied, because of the broadening scope of cancer research, with effective study being done by organizations without such direct connections.

Another shift has occurred in major emphasis. Centers that once included research beds in their institutional research grant budgets are finding it increasingly possible to provide beds in publicly constructed, staffed, and operated hospitals. The expense was heavy, often $20 to $30 a day for each patient. Because of this change, some of the society's funds have been freed for other research activities. Here is an excellent example of the function of the voluntary health agency of establishing an activity, demonstrating its need, and then transferring heavy operating costs to agencies supported by tax funds.

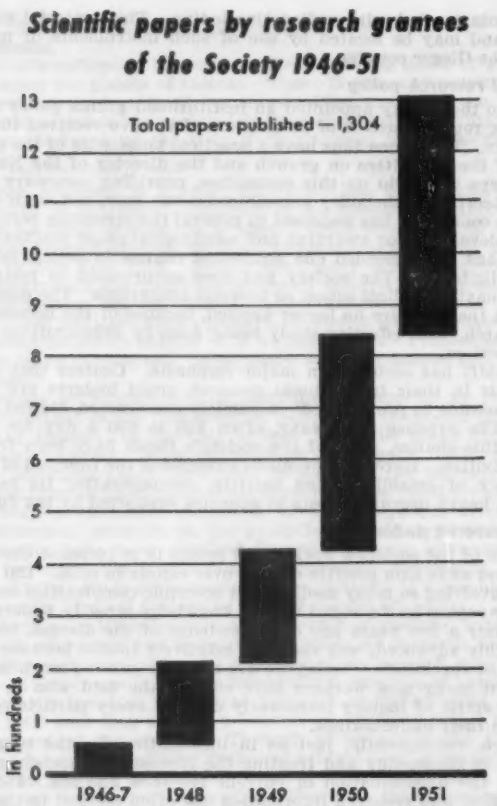
Spreading research findings

A principle of the society's work at all points is to increase our knowledge in such a manner as to gain positive control over cancer in man. But in so massive a problem, involving so many medical and scientific complexities and such varied tactics and weapons in the social attack, knowledge must be widely shared to be effective. Only a few years ago our knowledge of the disease, though in some quarters highly advanced, was rendered relatively inutile because confined to a small group of specialists. Today we are not only gaining much new knowledge of cancer but many new workers have entered the field who in an awakened and restless spirit of inquiry incessantly demand every particle of information bearing upon their undertakings.

In research, consequently, just as in information for the practicing doctor which helps in diagnosing and treating the disease, the society gives constant attention to the dissemination of current research findings. Indeed, the two fields of medical and research information are often merged in the rapid transmission to doctors of new information in pages of the society's medical publications—the journal Cancer, CA, the professional monographs, and Cancer Current Literature (previously mentioned). In research, however, still other means for spreading information, specifically for the research worker, are vigorously employed by the society.

Each year the society publishes, and distributes widely amongst scientists, substantial volumes which summarize in concise form progress in the institutional grants research program, institution by institution, and, in the annual report of the committee on growth, project by project, advances in the grants-in-aid and fellowships program. The society subsidizes Cancer Research, the monthly journal of the American Association for Cancer Research, in which outstanding current work is fully reported. It sponsored with the association and the National Cancer Institute in 1952 the Second National Cancer Conference, attended by over 1,400 scientists and physicians; and is publishing in book form the 325 papers presented at the meeting. It makes reprints of articles published in scientific journals by society grantees freely available to the authors, and periodicaly assembles these reprints in bound volumes for deposit in key scientific and medical libraries. It also maintains a loan service through which reprints of all published papers on cancer are made available to investigators.

Besides its efforts to keep the research scientist and the physician constantly informed on findings in cancer research, the society is well aware of widespread public interest in the subject. News releases covering developments in society-supported research across the country are regularly issued. This material for science writers, who work largely for newspapers, is supplemented by the society's staff liaison with magazines, radio, and television. Thus the public



Research papers of Society grantees start chain reactions of scientific interest, amplify results. Their number has grown impressively since 1946.

is given in intelligible terms a picture of the long, slow laboratory struggle to understand and control cancer and of the occasional but signal triumphs of the research worker.

"If faced by a stubborn enemy"

The society's philosophy is well expressed in the opening section of the Committee on Growth's Sixth Annual Report to the Society, published in October 1952.[1] It reads in part: "In the field of cancer no valid distinction can be drawn between pure and applied research. The investigator in the basic sciences is constantly developing new ideas, devising new tools and exploring new methods of approach which he refines and passes on to the clinical investigator. The latter, as constantly, is redefining problems, passing back new leads, testing out ideas at the clinical level, and, thereby, channeling the effort of the random investigator. The direct and oblique approaches are not so much competitive

[1] Reprints of statement available from American Cancer Society, 47 Beaver Street, New York 4, N. Y.

as complementary. The issue is not between alternative strategies. If you are faced by a stubborn enemy, a frontal assault is strengthened, not weakened, by a simultaneous and sustained attack upon his lines of communication and his source of supply. Concentration of effort is good strategy when you have taken the measure of your opponent, have counted his resources and have found his weaknesses. It is poor strategy in a war of maneuver when you are still feeling him out, still seeking out his main line of defense. In this situation pressure must be maintained on all fronts. One must probe continually anywhere and everywhere looking for the weak spots. The war on cancer is still a war of maneuver. The enemy is not yet pinned down. We are not yet in position for the grand assault. We are not yet sure what types of weapons will be most effective in subduing him."

The research record of the society is broadly encouraging, but more can be done and more will be done as adequate funds are obtained. A stable foundation has been laid, and the spirit of inquiry concerning cancer greatly stimulated among scientists and scientific institutions. The work under way must be sustained and strengthened and new work undertaken. Generous public contributions will make possible a greater effort.

FUND RAISING

The society's fund-raising crusade means everything to cancer control. Larger sums are needed each year to continue and expand the society's vast research, education, and service program. But the annual appeal may not be measured alone in terms of needed funds contributed by the public. What the public learns about the disease during the campaign can be counted in lives saved as well as dollars raised. The cancer control message reaches more millions of people during April than at any other period of the year.

1952 crusade a success

Each year as the society's effectiveness grows, fund-raising draws many new thousands of people and hundreds of new groups—fraternal and service, labor and industry, business and finance, farm and city, community and philanthropic, units of government from town to national—into cancer-control work. This growing understanding of the urgency of cancer control foreshadows our ultimate success in controlling the disease.

On both fronts—dollars raised and education—the 1952 crusade was a success. The 1952 goal of $16 million was passed. The public contributed $16,438,184.65—$1,463,670.96 more than in 1951. If the momentum is maintained—and weak spots strengthened—much more can be achieved both in dollars raised and education in the future. The over-the-goal $438,184.65 contributed by a public conscious of the growing threat of cancer means, for example, an added $109,584 in 1953 for vital cancer research alone.

Success in raising $16,438,184.65—in persuading men and women of all races, faiths, and interests to give to fight cancer—reflects the growth the society has made in vigorous and effective financing of the fight. In 1945—the year of the society's reorganization—only $4,249,491.56 was raised. The 8-year difference between then and 1952 is $12,145,693.09.

Crusade highlights

Fifty divisions collected more money in 1952 than in 1951. Half of these divisions accounted for more than 90 percent of the $1,463,670.96 increase; 42 divisions exceeded their goals. The previous high was 41 divisions in 1947, when the national goal was only $12 million. Notable gains were made by some of the larger divisions of the society, which carry a substantial part of the national goal each year.

Three divisions—California, Pennsylvania (exclusive of Philadelphia), and New York City raised more than $1 million each. It was the first time for California and Pennsylvania.

Six divisions have reached their goal every year since 1946.

Seven divisions have never reached their goal.

Nine divisions raised less money in 1952 than in 1946.

Lessons of the appeal

It is always encouarging to exceed the national goal. However, it would be far more gratifying if every one of the 61 divisions passed its goal. Improvements are possible.

Analysis of division reports on the 1952 campaign shows that States with large rural populations—as Alabama, Maine, North Dakota, Idaho, New Mexico, Oklahoma, Iowa, North Carolina, West Virginia—raised 56.2 percent of their funds through residential solicitations. In urban States—as California, Connecticut, Michigan, Illinois, Pennsylvania, Massachusetts—26.4 percent came from residential coverage. The urban States, however, report 12 percent from special gifts activities, and 9.3 percent from trades and industry activities—gifts from firms, executives, and employee groups. The rural States report 7.3 percent from special gifts and 9 percent from trades and industry. A study of large city reports—Brooklyn, Washington, Baltimore, New York, Louisville, Philadelphia, Salt Lake City—shows that 17.8 percent of the total was raised through special gifts—18.9 percent through trades and industry. The remainder of the 1952 funds came from lesser but very important categories—theaters, benefits, dinners, coin cans, etc.

This is the first year that such an analysis has been possible. The results have been taken into account in projecting the 1953 financial and educational goals. Only in this way can the society realistically evaluate its progress in reaching all segments of the public.

The challenge of federation

The society does not underestimate the fact that two of the larger divisions which made notable gains in 1952—Philadelphia and southeastern Michigan—participated in united fund campaigns. Nor does it minimize the $1,800,000 the society received through federated campaigns in 207 cities in 33 divisions. But the society believes that the best interests of the attack on cancer—through research, education, and service to the cancer patient—are served by preserving an independent campaign.

Naturally the money raised is important and it seems clear that the society's share from joint campaigns, community chest or federation, does not increase in the healthy fashion as the society's returns do when it conducts its own independent drive for funds. The most conspicuous example in 1952 of large returns from federation comes from southeastern Michigan (Detroit and neighboring counties) where the $311,878.45 represented an increase of 242.6 percent over 1951. Yet in 1947, the society by its own efforts raised more—$315,908.33—in southeastern Michigan than the federated fund contributed in 1952.

In the face of growing pressure for federation, it is encouraging to see many divisions resisting the united fund trend. The policy of the society still is to conduct its own independent campaign during April, except in those communities where the division is persuaded that insistence on independent action might prove harmful to cancer control. This may occur when community pressure for federation is very strong—when public opinion is solidly against independent, voluntary fund-raising. Only then will the society, while providing careful guards to protect its program, enter federation.

Up to this point, the society has won the Dayton, Ohio case—a litigation started 2 years ago to establish the society's fundamental right to conduct its own fund-raising campaign. When Dayton denied the society the right to conduct an independent drive, the society turned to the courts. In December 1952, the Ohio Court of Appeals upheld a lower court and the society's contention, declaring unconstitutional the Dayton ordinance which required a city permit for any charitable fund raising. The case is now before the Ohio Supreme Court. The Ohio Court of Appeals held the Dayton ordinance an "unreasonable, arbitrary, discriminatory, and an unlawful delegation of power" in that it authorized the city's solicitations advisory board to determine whether "the applicant's proposed object was already covered, and if so, whether the coverage was adequate," and also whether the ACS's proposed solicitation would be beneficial to Dayton or a burden on those solicited. The court ruled that the provision of the local law was in violation of the Constitution of the United States—a denial of the right of free speech and free press; a denial of liberty without due process of law. If higher courts sustain the society's position, it will mean that the society has established, under the Constitution, the right to conduct independent fund-raising campaigns in any city in the Nation.

The crusade and democracy

The reason for the society's insistence on the right to determine whether there shall be an independent campaign grows out of the nature of cancer—and out of the nature of our democracy.

Consider cancer first. In no other disease is delay in diagnosis so dangerous, hence the great emphasis on education. The independent drive offers the

best opportunity to alert men and women everywhere to the facts about cancer and what they can do about it. The core of the society's annual crusade is thus the human heart and the human conscience. It gives hundreds of thousands an opportunity to strike back against an enemy that has in one way or another threatened their personal welfare or happiness.

A famous poet, Edna St. Vincent Millay, contributing $50 to the society after her husband and a poet friend had died of cancer, wrote: "I want to give much more to the American Cancer Society. * * * To me long before any of these deaths occurred, cancer was the most horrible and most to be dreaded of all diseases. * * * I used to think I knew something about pain. But I realize I have never suffered at all, that I cannot even imagine what suffering might be."

Of immense importance also in the society's emphasis on the independent campaign is its relationship to democracy. As the French traveler, de Tocqueville, pointed out years ago, one of the great strengths of our way of life is the multitude of independent charitable agencies in the Nation. They give the citizen a chance to belong—to relate himself or herself to a vital activity, to serve as a counterbalance for the immense power of the state. The independent, voluntary health agency expresses and strengthens our democracy.

When an agency loses its responsibility for its own financing, it loses a measure of its independence. It seems clear that if city federations expand to State federations, as has been proposed, there will soon be a national federation. More and more the power will be concentrated in fewer and fewer hands. The use of the charity dollar will be determined by a very limited group. The threat of monopoly in the field of philanthropy has not been given enough thought by the advocates of federation.

Factors of success

The 1952 crusade, launched on April 1 after months of hard, concentrated preparation, mounted the greatest, most intensive attack ever made against cancer.

The striking success of the campaign must be attributed to—

The splendid cooperation of hundreds of thousands of volunteers who contributed time, effort, and enthusiasm. Nearly all divisions reported more volunteers participating in the fight against cancer than ever before. Some divisions reported as much as a 25-percent increase.

The millions of dollars worth of time, space, and effort contributed by radio, TV, magazines, newspapers, films, newsreels, writers, columnists.

The fine talent generously contributed by stars in the entertainment world—film, stage, radio, television.

The strong support of people in public life—the President of the United States, Cabinet members, Senators, governors, mayors.

Federal employees whose contributions to four divisions alone amounted to $450,790.37.

The spirited help of our defense forces; troops fighting in Korea—Army, Navy, Marine, Air Force; occupation forces in Europe; Armed Forces everywhere in the United States. In two States Armed Forces made additional contributions to put the campaign over the top.

Cooperation from business and industry, labor, civic groups, churches, veterans and fraternal organizations, farm groups, women's organizations, medical and health groups.

And above all, the conscious appraisal by the public of the urgent need for cancer control.

The future

All this augurs well for the fuutre. There are, however, hard problems that must be met in financing the fight against cancer that is ahead of us. A strong foundation has been established. With public support proportionate to the gravity of the problem, the society could extend its work so as to save more lives today, and intensify its research program so as to bring closer the day of freedom from cancer.

But the society faces the same problem that faces all departments and institutions of our national life. Rising costs have shrunk the cancer dollar—just as it has all other dollars. The 1952 total of $16,438,184.65 raised will not pay for much more research, education—both professional and lay—and service to cancer patients than the $12,136,875 raised in 1947.

The task ahead is to get more cancer dollars so that it will be possible to move out ahead with new strength. Investment in cancer control is an investment in saving lives. It is saving lives today. It can save a great many more in the

future, if the people everywhere understand the real value of their contributions to the society's work.

FINANCE

Report on national headquarters and the 61 chartered divisions

It is the policy of the society to report to the contributing public about the funds collected on a national scale. The statements which appear below reflect the financial position of the entire society at August 31, 1952, and the combined results of its operations for the year then ended. These statements have been compiled by the comptroller from audit reports of the 61 divisions and the national headquarters.

During the 1951–52 fiscal year $15,352,823 was expended by the society from its general and research funds to further its program of research, education, service to the cancer patient and other activities. When related to the society's program budget of $15,891,626 for the same period, these expenditures indicate how closely the society adhered to its planned program—expressed in percentages it was equal to 96.6 percent. The total expenditures for the previous year were $13,572,059.

The amount of funds contributed by the public during our annual campaign is a major factor in planning the society's program for the ensuing year. During the fiscal year ended August 31, 1952, the society raised $16,438,185 representing an increase of $1,463,671 over the previous year. The additional amount raised is reflected in the total funds available at August 31, 1952, which amounted to $20,977,000 and which exceed the balance available at the end of the preceding year by $1,431,000. As shown on the following page, of the $20,977,000 available the society has budgeted $17,163,668 to be expended between September 1, 1952, and August 31, 1953, for research, professional, and public education, service to the cancer patient, fund raising, and administration. In addition the sum of $1,584,750 has been allocated for recommendations of the committee on growth for specific grants and fellowships for which payments will be made between September 1, 1953, and June 30, 1954. The remainder, representing slightly in excess of 10 percent of the funds available, is to be used for program supplementation and contingencies. While it is not the policy of the society to accumulate reserves from the proceeds of its annual campaigns, a small contingency fund is desirable because of the importance of continuity in the society's educational, service, and research programs.

General and research funds of the national headquarters and the 61 chartered divisions available at Aug. 31, 1952

General funds	$14,739,562
Research funds	6,237,438
Total	20,977,000

The sources of the above funds are shown below:

	Percent	Amount
1952 campaign income	78	$16,438,185
The cost of raising this money was $1,769,695 or less than 11 percent.		
Prior campaigns	20	4,090,776
Carryover amounted to $4,090,776 including the unpaid balance ($1,692,000) of 1951 income earmarked for research.		
Interest, etc.	2	448,039
The funds of the society are invested principally in U. S. Government securities to provide supplemental income until required for program expenditures. This and other miscellaneous income and adjustments accounted for $448,039 or approximately 2 percent of the funds available at Aug. 31, 1952.		
Total available funds at Aug. 31, 1952	100	20,977,000

These funds will be used as follows:

1952–53 program budget	Percentage of program budget	Amount
Education	28	$4,838,637
Professional: Grants and fellowships, 4 percent; development and publication of materials, 2 percent; refresher courses, symposia, etc., 2 percent; salaries, 2 per cent; office expense, 1 percent. Public: Salaries 7 percent; information centers, training schools, travel and local projects, 5 percent; development and publication of materials, 4 percent; office expenses, 1 percent.		
Research	27	4,630,130
40 institutional grants, 11 percent; 246 grants-in-aid, 10 percent; local awards by divisions, 2 percent; 62 fellowships, 1 percent; 11 scholarship grants, 1 percent; travel and expenses of committee on growth, 1 percent; evaluation and processing of project applications, 1 percent.		
Service to the cancer patient	26	4,457,218
Cancer clinics, detection centers, indigent care, mobile units, etc., 11 percent; transportation of patients, dressings and supplies, loan closets, 9 percent; salaries, 5 percent; office expense, 1 percent.		
Fund raising	11	1,863,118
Salaries, 5 percent; development and issue of materials, 3 percent; office expense, 2 percent; travel, meetings, organization, etc., 1 percent.		
Administration	8	1,374,565
Salaries, 5 percent; office expense, 2 percent; travel, meeting expense, audit fees, bulletins, etc., 1 percent.		
Total 1952–53 program budget	100	17,163,668
Grants approved for 1953–54 research program		1,584,750
Grants and fellowships recommended by the committee on growth and approved by the society are made to research scientists for a period from July 1 to June 30 of each year. This amount will be held by the society and paid out between Sept. 1, 1953, and June 30, 1954.		
Program supplementation and contingencies		2,228,582
Since the society is dependent upon public support from year to year for its entire program, a small contingency fund is necessary to provide stability. In addition, some unbudgeted funds must be available to meet unforseen critical needs. The sum of $2,228,582 is held in reserve for these 2 purposes.		
Total allocation of funds available at Aug. 31, 1952		20,977,000

American Cancer Society, Inc., national headquarters and chartered divisions—Combined balance sheet, Aug. 31, 1952

ASSETS

General funds:		
Cash		$13,655,387
Investments:		
U. S. Government securities, at cost		2,788,666
Other		80,120
Accounts receivable		205,751
Inventory of educational, campaign, and service materials, at cost		196,474
Prepayments, accrued interest, etc		138,937
Furniture and equipment, less reserve		377,467
Subtotal		17,442,802
Less: Amount transferable to research funds as remittances of campaign proceeds are received by national headquarters from the chartered divisions		2,535,415
Subtotal		14,907,387
Research funds:		
Cash	$936,169	
U. S. Government securities, at cost	2,742,889	
Accrued interest	22,965	
Amount transferable from general funds, as above	2,535,415	
		6,237,438

American Cancer Society, Inc., national headquarters and chartered divisions—Combined balance sheet, Aug. 31, 1952—Continued

Special and restricted funds:		
Cash	$933,643	
Investments:		
U. S. Government securities, at cost	987,610	
Other	234,483	
Land and building, less reserve	369,069	
Other assets	17,934	
		$2,542,739
Total		23,687,564

LIABILITIES AND FUND CAPITAL

General funds:		
Accounts payable and accrued liabilities		$139,159
Deferred income: Grants-in-aid received from U. S. Public Health Service for professional films for ensuing fiscal year		28,066
Fund capital		14,739,562
The foregoing balance is budgeted for expenses of $12,533,000, for education, service, fund raising, and administration for the year commencing Sept. 1, 1952, and the remainder is available for program supplementation and contingencies.		
Subtotal		14,907,387
Research funds:		
Unexpended balance of research projects approved	$3,546,902	
Amounts allocated for recommendations to be received from the Committee on Growth of the National Research Council	2,100,000	
Balance awaiting allocation to research projects	590,536	
		6,237,438
Special and restricted funds:		
Mortgage payable ($264,952) and accrued liabilities	275,737	
Fund balances:		
Legacy fund capital ($271,289 restricted to research)	1,491,534	
Other special and restricted funds	775,468	
		2,542,739
Total		23,687,564

American Cancer Society, Inc., national headquarters and chartered divisions—Combined statement of capital accounts for the year ended Aug. 31, 1952

	General funds	Research funds	Special and restricted funds
Balance, Aug. 31, 1951	$13,736,558	$5,809,836	$1,972,348
Income:			
1952 campaign contributions	16,438,185		
Income from endowment fund	30,108		
Legacies			590,123
Interest	87,676	54,367	16,536
U. S. Public Health Service grants-in-aid for professional films and cancer conferences	33,333		
Other income and adjustments (net)	237,610	4,945	104,307
Total income	16,826,912	59,312	710,966
	30,563,470	5,869,148	2,683,314
Transfers to research funds and to special and restricted funds	(4,813,529)	4,710,734	102,795
Subtotal	25,749,941	10,579,882	2,786,109
Expenditures:			
Research		4,342,444	157,883
Education	4,146,823		170,865
Service to the cancer patient	3,508,174		190,359
Campaign, National, State, and local	1,769,695		
Administration, National, State, and local	1,485,687		
Total expenditures	11,010,379	4,342,444	519,107
Balance, Aug. 31, 1952	14,739,562	6,237,438	2,267,002

Parentheses denote red figure.

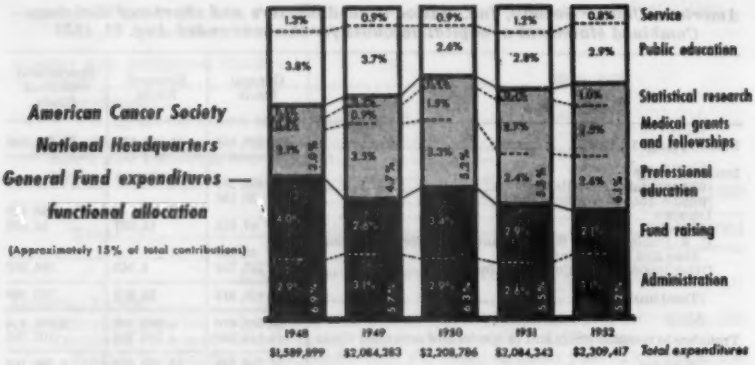
Report on national headquarters

Twenty-five percent of the funds collected during our annual drive is allocated for the society's national research program. The national headquarters received $4,109,546 for this purpose as a result of the 1952 campaign. In the 1952–53 fiscal year it is planned to spend $4,167,012 for 246 grants-in-aid, 40 institutional grants, 62 research fellowships, and other research projects. During 1951–52, $3,805,353 was expended for similar research activities.

The society's policy also provides that 15 percent of the funds collected be allocated for national programs of professional and public education, medical grants and fellowships, service to the cancer patient, fund raising, and for technical and advisory services to the divisions. The national headquarters received $2,464,636 for these purposes from the 1952 campaign. These funds will finance its 1952–53 budget of $2,480,000. Approximately two-thirds is to be used for its share of the society's integrated program of education and service, and for medical grants and fellowships to institutions and individuals active in the cancer field. From these funds will also be provided the tools—motion pictures, radio and television programs, exhibits, monographs, pamphlets, etc.,—and other services needed to carry out the overall programs of the society. The remaining one-third, or approximately 5 percent of the total funds collected, will be spent on fund raising and administration by the national headquarters. Its total program budget for the preceding year was $2,410,000; actual expenditures amounted to $2,309,417, a ratio of 95.8 percent.

The excess of the 1952–53 planned expenditures for research and for the national headquarters program over the amounts allocated from the 1951–52 campaign will be offset by interest, miscellaneous income, and a small balance remaining from prior years' campaigns.

The divisions of the society retain 60 percent of all funds collected during the year. These funds are used to carry on divisional aspects of the society's programs of education, service to the cancer patient, fund raising, and administration.



Financial statements of the American Cancer Society, Inc. (national headquarters) for the fiscal year ended August 31, 1952, together with the certificate of our auditors, Arthur Andersen & Co., are presented on the following pages.

AMERICAN CANCER SOCIETY, INC. (NATIONAL HEADQUARTERS)

Balance sheet, Aug. 31, 1952

ASSETS

General fund:		
Cash		$161,930.39
U. S. Government securities (principal amount $900,000), at cost		900,437.50
Accounts receivable:		
Due from chartered divisions:		
Campaign contributions	$4,055,571.66	
Sales of materials, etc	58,674.16	
Due from others	3,557.91	
		4,117,803.73
Accrued interest		19,850.65
Inventory of educational, campaign, and service materials, at cost		164,031.90
Prepayments and deferred charges		46,284.01
Furniture and equipment, less reserve of $52,909.36		50,393.66
Total		5,460,731.84
Less: Amount transferable to the research fund as remittances of campaign proceeds are received from chartered divisions (note 2)		2,535,414.59
Total		2,925,317.25
Research fund:		
Cash	$702,968.65	
U. S. Government securities (principal amount $2,740,000), at cost	2,742,889.13	
Accrued interest	22,964.57	
Amount transferable from general fund, as above (note 2)	2,535,414.59	
		6,004,236.94
Special and restricted funds:		
Cash	15,513.01	
Investments:		
U. S. Government securities (principal amount $708,050), at cost	707,621.00	
Other	75,228.00	
Accounts receivable from chartered divisions and other assets	37,355.56	
		835,717.57
Total		9,765,271.76

AMERICAN CANCER SOCIETY, INC. (NATIONAL HEADQUARTERS)—Continued

Balance sheet, Aug. 31, 1952—Continued

LIABILITIES AND FUND CAPITAL

General fund:		
Accounts payable		$57,189.95
Deferred income: Grants-in-aid received from U. S. Public Health Service for professional films for ensuing fiscal year		28,666.04
Fund capital (note 3)		2,839,461.26
Of the foregoing balance $2,480,000 is budgeted for education, service, statistical research, administration, and fund raising for the year commencing Sept. 1, 1952.		
Total		2,925,317.25
Research fund (note 2):		
Unexpended balance of projects approved	$3,493,011.69	
Amounts allocated for recommendations to be received from the committee on growth of the National Research Council	2,100,000.00	
Balance available for other research projects	411,225.25	
		6,004,236.94
Special and restricted funds:		
Legacy fund capital ($271,289.72 restricted to research)	759,107.84	
Other special and restricted funds	76,609.73	
		835,717.57
Total		9,765,271.76

The accompanying notes to financial statements are an integral part of the above balance sheet.

Statement of capital accounts for the year ended Aug. 31, 1952

	General fund	Research fund	Special and restricted funds
Balance, Aug. 31, 1951	$2,576,499.54	$5,642,968.18	$841,280.68
Income:			
Share of 1952 campaign contributions (notes 1 and 2)	2,464,636.02	4,109,546.16	
Income from endowment fund (note 4)	30,108.18		
Legacies (including $25,030.71 restricted to research)			111,583.75
U. S. Public Health Service grants-in-aid for professional films and cancer conferences	33,332.65		
Interest and miscellaneous income (net)	44,302.55	57,075.78	6,686.80
Refund to Damon Runyon Memorial Fund for Cancer Research, Ind.			(5,390.15)
Total income	2,572,379.40	4,166,621.94	112,880.40
	5,148,878.94	9,809,590.12	954,161.08
Expenditures:			
Research		3,805,353.18	118,443.51
Professional education	768,994.07		
Public education	447,272.14		
Professional service	51,856.72		
Lay service	90,429.16		
Statistical research	148,798.15		
Administration	482,130.73		
Fund raising	319,936.71		
Total expenditures	2,309,417.68	3,805,353.18	118,443.51
Balance, Aug. 31, 1952	2,839,461.26	6,004,236.94	835,717.57

The accompanying notes to financial statements are an integral part of the above statement of capital accounts.

NOTES TO FINANCIAL STATEMENTS, AUG. 31, 1952

(1) These statements reflect only the position of American Cancer Society, Inc. (national headquarters) at Aug. 31, 1952, and the results of its operations for the year then ended. The accounts of the chartered divisions of the society are maintained individually by these organizations and separate financial statements are prepared therefrom. 1952 campaign collections by national headquarters and reported collections by the divisions totaled $16,438,184.65, of which substantially 40 percent has been allocated to national headquarters and is reflected in these statements.

(2) The board of directors on June 15, 1951, reserved for research an amount equal to 25 percent of the total reported collections in the 1952 national campaign. This amount, $4,100,546.16, was added to the balance of the research fund available for other research projects and on July 31, 1952, $2,100,000 of these funds was allocated for recommendations of the committee on growth of the National Research Council for grants-in-aid and fellowships.

(3) Commitments aggregating approximately $400,000, under uncompleted contracts for the production of brochures, films, exhibits, and other educational material ($100,000) and grants for clinical fellowships and miscellaneous grants ($300,000) have not been reflected in the accompanying statements; however, provision has been made therefor in the approved budget for the fiscal year ending Aug. 31, 1953.

(4) The American Cancer Society, Inc., is the beneficiary of the income from a trust fund established in 1927, known as the endowment fund. Pursuant to the terms of the trust agreement, the disposition of the income of the trust fund is subject to review at 10-year intervals by a committee which may at the time of the review designate the beneficiary of such income for the following 10-year period. The American Cancer Society, Inc., has been designated as the beneficiary until May 2, 1957.

NATIONAL HEADQUARTERS AND CHARTERED DIVISIONS—1952 CAMPAIGN CONTRIBUTIONS—SEPT. 1, 1951, TO AUG. 31, 1952

Division:	*Reported gross contributions*
Alabama	$166,492.43
Alaska	34,584.72
Arizona	30,415.05
Arkansas	69,714.05
Brooklyn, N. Y.	141,408.66
California	1,069,526.07
Colorado	139,566.92
Connecticut	400,637.40
Delaware	72,891.06
District of Columbia	208,368.62
Florida	187,178.64
Georgia	279,131.91
Idaho	100,123.87
Illinois	926,603.18
Indiana	352,783.19
Iowa	501,073.40
Kansas	248,449.00
Kentucky	204,766.26
Louisiana	186,194.31
Maine	96,658.11
Maryland	324,746.36
Massachusetts	590,009.33
Michigan	372,787.29
Milwaukee, Wis.	131,994.99
Minnesota	304,569.53
Mississippi	160,784.95
Missouri	362,762.67
Montana	91,091.04
Nassau County, N. Y.	136,192.44
Nebraska	91,555.73
Nevada	24,995.99
Carried forward	8,008,057.17

Division:	*Reported gross contributions*
Brought forward	$8,008,057.17
New Hampshire	66,238.41
New Jersey	735,025.00
New Mexico	27,169.55
New York State	763,918.49
New York, N. Y.	1,035,686.08
North Carolina	297,364.50
North Dakota	80,272.02
Ohio	845,022.52
Oklahoma	140,835.25
Oregon	131,632.65
Pennsylvania	1,059,274.77
Philadelphia, Pa.	521,639.26
Puerto Rico	55,337.96
Queens County, N. Y.	94,527.19
Rhode Island	86,294.19
South Carolina	145,663.48
South Dakota	53,256.31
Southeastern Michigan	311,878.45
Staten Island, N. Y.	21,183.50
Suffolk County, N. Y.	53,680.86
Tennessee	231,842.80
Texas	536,999.27
Utah	55,871.80
Vermont	48,026.48
Virginia	278,072.18
Washington	199,836.08
Westchester County, N. Y.	181,467.50
West Virginia	111,412.06
Wisconsin	217,943.14
Wyoming	31,839.48
Subtotal	16,427,268.40
Canal Zone	10,916.25
Total gross contributions	16,438,184.65

This summary of campaign contributions is presented as an exhibit with the report of the society and is not covered by the auditors' certificate.

LEGACIES

An increasing number of individuals are leaving sums of money, large and small, to continue the fight against cancer after their lifetime.

Funds thus willed to the American Cancer Society become a living memorial to the givers who have the advantage of knowing that their money will keep on fighting cancer after they are gone.

During the last fiscal year the national society received $111,584 from bequests and the divisions received $478,539 for a total of $590,123.

Under a new policy, all bequests received by the national society or any of the divisions after September 1, 1952, will be distributed—40 percent to research and 60 percent to the division in which the testator resided, unless otherwise specified in the will.

Over a 4-year period—1949 through 1952—the national society received $653,970 from 105 legacies while $985,829 was received by divisions, for a total of $1,639,799, as shown in the following table, to carry on cancer research, education, and service programs:

Fiscal year	Number of legacies to national	Amount to national	Amount to divisions	Combined national and divisions
1949	19	$75,395	$20,915	$96,310
1950	16	98,779	146,784	245,563
1951	38	368,212	339,591	707,803
1952	32	111,584	478,539	590,123
Total	105	653,970	985,829	1,639,799

During the previous 3-year period—1946 through 1948—the national office received $118,423.28 from 55 bequests.

At the end of the fiscal year, August 31, 1952, the national office had 65 pending estates in which the contingent interest was estimated at $750,000. This income will be received over a future period of years.

The suggested form for naming a division of the American Cancer Society as beneficiary of a will is:

"I give and bequeath to the (insert correct corporate title and address of division here as appears on pages 10–11 of this report) the sum of $---------- to be used for the general purposes of the society."

Testators wishing to name the national society as a beneficiary may use a similar form but they should insert "American Cancer Society, Inc., 47 Beaver Street, New York 4, N. Y.," instead of the name and address of a division of the society.

Memorials

Each year the society receives an increasing number of memorial contributions from friends and relatives of persons who have died of cancer. Such contributions are acknowledged to the donor, and a notification of the gift is sent to the family of the deceased reporting the donor's name, but not mentioning the amount of the contribution.

Mr. RUNYON. Mr. Chairman and members of the committee and others, in any battle waged on a front as broad as the one which has been described to you this morning the organization to carry out effective warfare must be well organized and well oriented and well integrated; so I would like very briefly to describe those organizations which—some of them for a longer period of time than others—have been active in this field of attack on the cancer problem, how they work together, and their means of exchanging information where that is essential and processing things jointly where that is essential in the interest of economy and efficiency.

I shall start with the American Cancer Society, because that is the oldest organization and the one with which I am most completely familiar. Its history goes back to 1913, when it was formed as the American Society for the Control of Cancer, as a medical organization purely and simply, to pass information along among the doctors. It maintained very much that same character until 1935, when the

necessities of public education in the field of cancer became more evident.

At that time there was a partnership formed between the American Society for the Control of Cancer and the American Federation of Women's Clubs, under which they undertook public education as it referred to cancer as one of their projects of the American Society in the field. They worked cooperatively until 1945, when there was a rather complete reorganization of the society with businessmen coming in, in partnership with the women and the doctors, putting business methods into the operation, with an intensifying of the appeal to the public, and with, perhaps more importantly, an adopting as the cornerstone of the entire program research into the nature of cancer to determine its cause and perhaps be able to cure or prevent it.

From that time on the growth of the American Cancer Society has truly been quite phenomenal, as is evidenced by one of the exhibits before you, showing the financial growth of the society by years from 1938, when we raised $133,000, to 1953, when we have raised just under $20 million.

The American Cancer Society is a voluntary agency, nationwide; a national society governed by a board of 56 directors, half laymen and half medical and scientific, to carry out work in the field through 60 divisions covering every State in the Union, Washington, and Alaska, with affiliated organizations in Puerto Rico, Hawaii, and the Canal Zone.

The CHAIRMAN. Before you leave that subject, is it your intention to give some idea of how that $20 million is dispensed?

Mr. RUNYON. It is my intention to; yes, sir.

The American Cancer Society is working in substantially all of the 3,000 counties in this country, so that it can be said to be a truly nationwide organization, operating right down to the grass roots level. There are perhaps several hundred thousand volunteers who in one way or another devote some time and effort to the affairs of the American Cancer Society.

As you have been told this morning, since the problem of cancer is still very largely one of early detection and prompt diagnosis and treatment, the educational program of the American Cancer Society is a most important one. Education of the public in order to induce them to go to their doctors when one of the danger signals appears and to inform them of the danger signals is one thing; and, secondarily, to persuade them also to have periodic physical examinations so that even before one of the danger signals appear, if cancer is becoming evident, it will be picked up. And there is professional education, so that the latest changes coming out of the research program can be made available to the doctors, so that they may be up to date at all times on diagnostic improvements, treatment improvements, and so on.

Then there is the research program of the society, which got under way in 1945, which is a national program administered entirely from the national level and to which the society has devoted substantially $30 million in the last 8 years. I think this will be described in more detail by others, but I might make three general statements of principle here.

The American Cancer Society conducts no research of its own. It supports research conducted by others. It operates no diagnostic or treatment facilities of its own, but supports those in conjunction with hospitals, medical schools, and so on. And the American Cancer Society puts none of its funds into construction of hospitals, laboratories, or other facilities.

The society also conducts a program of service to the cancer patient. This service takes many forms that will be described in more detail by Dr. Cameron, but to a considerable extent it is service which can be performed on the lay side by the volunteers in the way of bandages, transportation, home visiting and so forth, and by the doctors through the cancer clinics to which they give time and attention.

The statement which you have before you shows the Americon Cancer Society's expenditures for the years 1949 through 1953. We have an accounting setup which permits us to render one report on a national level of all income and all expenditures from these counties, from the State divisions, and from the national organization. In other words, this is a consolidated statement of expenditures broken down into the five categories which we have adopted for bookkeeping purposes.

You will note there at the top of this schedule it shows the amount devoted to research, which, under our policy, is a minimum of 25 percent of what is collected each year in the annual drive.

Then education is a figure roughly about the same; slightly under the research figure across the 5 years. That is the expenditures that are made for both public and professional education.

The service to the cancer patient you can see has increased as greater funds have become available.

Then there are the expenses of raising this money, which have been very consistent over the past 5 years in spite of the fact that the amount of money raised has increased from $13 million in 1949 to $20 million in 1953. It has cost us no more money to raise it, nor has it cost more money to administer the expenditures of these large sums under our program.

Also appended to this statement is the most recent annual report of the American Cancer Society, which describes in great detail its unified attack on cancer on the national level, on the State level, and on the local level through these three programs of research, education, and service.

Through its organization of a national society of State divisions and of county units it is able to do those things nationally which can best be done nationally, such as the production of literature, movies, contacts with the press, with magazines, national television and radio chains, and so on; and to do those things on a State level which can best be done on a State level; and to do those things down in the community which can be done more effectively by the people there. There is very little overlapping in the work of the organizations.

The allocation of funds has been coordinated in these years and of all the money which has been raised, 25 percent has gone to a national research program; 60 percent has remained in the States to carry their own program of education and service, with some local research support, and 15 percent has gone to the national society for its share of the integrated program of education and service.

The progress or program of research will be described in more detail in a moment or two.

The next large unit is the National Cancer Institute of the United States Public Health Service which was formed in 1938. Its program in many ways is comparable to that of the American Cancer Society, although they do some things which we do not do and we do some things which they do not do. They have a program of intramural research which is carried out under their own direction. They make large grants to all the medical schools in the United States, which we do not do. We both support clinical and research fellowships, and they make grants to the States for the programs in the States, which are roughly comparable to the position of the Cancer Society's efforts which are handled by our State divisions.

They make special control grants, as do we; they also have supported the construction of laboratory facilities to the extent of about $16 million. We have done nothing like that with the American Cancer Society funds as a matter of policy.

Here it might be interesting to point out that in regard to the $16 million which is appropriated and now spent for the construction of laboratory facilities in cancer research throughout the country, approximately $100 million was subscribed locally. So, that money is returned about sixfold. It is our belief that both the American Cancer Society and the National Cancer Institute are supported by public funds. Those of the Cancer Society are given under voluntary donation at the time we conduct our crusade in April, and those to the National Cancer Institute through appropriations.

It has, therefore, been the belief of those charged with the responsibility of operating the American Cancer Society, that the most effective liaison and integration possible between these two organizations is not only good sense, but is absolutely essential. Accordingly, over the period we have voluntarily worked out many means of working together and no means of working in competition.

As an example of how we work together in the liaison and exchange of ideas I might point out that Dr. Heller is the director of the National Cancer Institute and also a member of the American Cancer Society board of directors, as was his predecessor, Dr. Scheele. Mr. James G. Adams, who has been identified actively with the American Cancer Society for many years as chairman of our executive committee, and now chairman of our research committee, has participated for the past 3 years on the Advisory Council of the National Cancer Institute. Dr. Cameron, who talked this morning so much to the point on the control part of this program, has served on the control grant study panel, the group which advises the National Advisory Cancer Council on what control grants should be made.

In addition to these more or less formal lines of communication, there is continuous staff attendance at each other's meetings. Representatives of the National Cancer Institute attend research meetings of the American Cancer Society and vice versa. There is joint service between members of our staff and their staff on committees, such as the American Committee for the International Union Against Cancer, and on the Lung Cancer Committee, as well as on the Gastric Cancer Committee. Also, there are frequently many joint project site visits to research institutions in the United States performing similar types of research.

On the State level, our State divisions and the State public health officers who I understand generally administer the grants to the States, work with more or less coordination. It varies from State to State but the pattern is being set.

We think that this will increase in effectiveness as time goes on.

Then we come to the things we do jointly together. One of the effective tools for professional education has been a series of very expensive movies for doctors. In the production and distribution of these, we have worked jointly with the National Cancer Institute. We have both done the planning and the production for this as well as taking care of the cost and we have distributed these films to doctors through our channels and the Public Health Service through their channels.

The same has been true with some of our special education movies. Perhaps the one which has been most widely known is the Breast Self-examination film, in which women are informed as to how to examine themselves.

The site pamphlets, some of which I think will be put in evidence, are jointly produced by the two organizations.

There have been two national cancer conferences held in this country at which doctors and laymen and scientists from the laboratories have gotten together, and over a week's period discussed problems of cancer—clinical cancer. Those have been jointly planned, jointly sponsored and jointly paid for. There is an integration of effort all down the line, which has resulted in a substantial economy.

Another job which the American Cancer Society undertakes is to inform congressional committees on appropriations of the need for proper and adequate appropriations for the United States Public Health Service and the National Cancer Institute. Over the past 5 or 6 years we have come down here each spring to give formal testimony on the cancer problem before committees—important subcommittees of the Congress.

I think you can see from the tabulation in front of you, the appropriations which have been made by an informed Congress for this attack through the United States Public Health Service.

Another organization in this field which should be mentioned is the National Research Council, which goes back I think as you know to the time of the Civil War.

At the request of the American Cancer Society, this council organized the committee on growth back in 1945 composed of American Cancer Society scientific advisers, and since that time, they have continuously advised us on various aspects of cancer control programs and specifically advised us on grants-in-aid and research fellowships and research scholarships.

They have set up at our request and the request of others—among them the American Medical Association and the National Cancer Institute, the Damon Runyon Fund also—a Committee on Cancer Diagnosis and Therapy, which was an organization set up so that any problems or therapy discoveries in cancer could have a fair and impartial trial, so that no claim could be made that anyone who had something which would be effective in the cure or treatment of this disease would be overlooked.

There is a twofold responsibility there. One is to make certain that nothing is overlooked; and, second, to protect the public so far as possible.

The National Research Council also provides an organization through which a continuous and running inventory of all cancer research going on in this country is maintained on a punchcard system, properly classified under headings which have been agreed to.

Then there is the Chemical and Biological Coordinating Service through which all chemicals which are tested or discovered at institutions around the country are centrally inventoried so that anyone else operating in the field can get information from this central register.

Then, there is the Damon Runyon Memorial Fund, a fund built upon the memory of Damon Runyon and carried forward so effectively by Mr. Winchell. It raises its money through public events, athletic benefits, memorials, and so on. It raises about $1 million a year, all devoted to research.

The Damon Runyon Fund, the American Cancer Society, and the National Cancer Institute all exchange full information on what projects they are supporting in cancer research, so that there is no mystery or secrets among the three.

There are other smaller foundations such as the Jane Coffin Foundation, the Childs Foundation, the Anna Fuller Fund, and the Pardee Foundation which are largely endowment foundations, the incomes from which are devoted to certain problems; that is, to one or the other phases of the cancer problem. These are the general fund-granting agencies active in the field of cancer.

The American Medical Association itself is also very active in this field. As a matter of fact half of the ACS Board is made up of medical people and half of these medical members have been members of the house of delegates of the American Medical Association.

I might say the American Medical Association has recently appointed a new committee, with its objective being to figure out how the American Medical Association and the voluntary health agencies can cooperate more effectively. That committee had its first meeting with representatives of the various voluntary health agencies, including the American Cancer Society, in Chicago just a week ago tomorrow.

The American Cancer Society is undertaking a number of experimental adventures in the field of professional education through the use of colored television, and Mr. Ralph Creer, of the American Medical Association, is on the advisory group as to how this can be set up and carried out most effectively.

So much on the national level. On the State and local level there is a closer coordination between our State divisions.

In our county unit and the corresponding State and medical associations and county medical societies to which we supply material suitable for the postgraduate professional education of doctors, movie slides, to be shown at meetings under the sponsorship of the American Medical Association, exhibits and so on at the National, State, and county meetings are provided by the Cancer Society.

The American College of Surgeons through its accreditation program for cancer facilities carries out an important project of the American Cancer Society, for which we reimburse them their cost.

These are some of the general organizations active in this field, and I think as I have indicated to you that close liaison does exist between

us, and that this is truly a unified action which we are carrying on against cancer.

It should be proper to metion here the cooperation which we get from other organizations, the press, the movies, radio, television, magazines, industry, labor, and so forth, in incorporating the cancer message in ways most effective to reach the American public.

I think that that very briefly outlines the various organizations here. I am sure that perhaps each of the other groups would like to speak more specifically to his own program. Thank you.

Dr. HELLER. Mr. Chairman, I would like to have an extension of some of the work that is going on, to point out the several areas of responsible interest on the part of the several organizations.

I wonder if Dr. Cameron would extend or place any remarks he has before the group concerning the activity of the NRC, or amplify upon any remarks made by Mr. Runyon.

Dr. Cameron.

Dr. CAMERON. I do not think at this moment, Mr. Chairman, that I need amplify the role of the National Research Council in the cancer program. You have heard it outlined. If we arrive at the point of more detailed discussion of the laboratory and experimental approach to cancer, I might have the opportunity then to discuss the general research picture as we see it now.

Dr. HELLER. Dr. Rhoads, would you care to amplify the activities of the Damon Runyon Fund? Have you any extended remarks particularly apropos to the research activities?

Dr. RHOADS. I do not think I am qualified to speak for the fund. Other active members are here.

Dr. HELLER. Since we have a recipient of some of the activities, Dr. Rottino, to my left, I think it probably would be timely, Mr. Chairman, to have some indication from him as to the impact of such grants and activities in which he is engaged with these several agencies.

Dr. Rottino.

The CHAIRMAN. We would be glad to hear from the doctor.

Dr. ROTTINO. Well, I could speak in a dual role, one as a researcher supported by grants and also as a member of a committee that advises on the donations or distribution of grants, and I would like to speak of the first.

I work in a large city hospital—approximately of 800-bed capacity—in a very busy part of the city. The purpose of the hospital essentially is to take care of the sick, but because of our size and the type of diseases that we encounter and the character of our staff, it becomes possible to go beyond simply taking care of the sick to other problems.

One, we are able to train young doctors in the future practice of their profession and also it is possible for us to conduct research work to a limited scope.

I think hospitals such as the one that I attend, represent a very large reservoir not only for teaching but also for research potential, if the proper aid is given to such institution.

The particular problem that we have tackled is Hodgkin's disease, which is a very special type of cancer. We have attempted to study the causes of this disease; we have experimented extensively with all types of therapy; we have also given assistance and encouragement

to any individual who feels that he has a cure for this disease in particular or for cancer in general.

In this work we have been helped by the American Cancer Society; we have been helped also by the United States Public Health Service; we have been helped considerably by the Damon Runyon Foundation and also from private sources. We have been most grateful for this support. Without it the work would not have been initiated, nor could it have been carried out.

Now I would like to emphasize some of the difficulties of institutions such as ours. One of the difficulties is that grants are given on a year-to-year basis and under such circumstances it is very difficult for a general hospital to attract good research men when it is impossible to offer them a job for more than a year at a time. This is no criticism against the various donating agencies, because they have been most generous, to me in particular. Now it seems to me that if a contribution can be made and the research potential expanded, one should take advantage of what large hospitals have to offer, and make it possible for them to offer research men a longer tenure than 1 year or 2 years at a time.

Dr. HELLER. Mr. Chairman, I would like at this point to ask the representative from the American Medical Association, Dr. Wermer, to indicate the role generally in the cancer picture in which the American Medical Association participates.

The CHAIRMAN. Before we enter upon that, would it be agreeable for you to have the members of the committee ask questions at this time if they so desire?

Dr. HELLER. Certainly, sir.

Mr. DOLLIVER. I would like to discuss a comment which was made by Mr. Runyon. I was very interested to know that the President of the Iowa Cancer Society is a very close personal friend of mine, Mr. Frank B. McTigue. I note he has been extremely successful in raising funds out there for the society in the amount of over $500,000 which was raised in Iowa, which compared very favorably with other more populated States.

Now, is it the fact, and do I rightly understand from your tabulation here, that approximately the same sum is raised from private sources for cancer research and the other activities, as are available from public funds? Is that a fair statement?

Mr. RUNYON. Approximately the same amount is raised by the American Cancer Society, which is only one of the voluntary or private organizations, as is granted in appropriations to the National Cancer Institute. If you added the American Cancer Society column, the Damon Runyon figure of about $1 million a year, and the other appropriations from these smaller funds, plus the appropriations that are made, which I have no way of estimating, from the organizations themselves to whom our support is but a part of what it costs to carry on this work——

Mr. DOLLIVER. Will you amplify that a little? What would be an example of that kind of organization?

Mr. RUNYON. Well, I think Dr. Rhoads would be a very good example of what I have in mind. We support the institute in which he is interested for cancer research to the extent of, I believe, nearly $400,000 a year against the total budget of about $2.5 million a year. Some more of that comes from the United States Public Health

Service, but a very substantial amount of it comes from sources which they tap directly themselves.

That same picture I believe is generally true in most research fields around the country. There are very few—none so far as I know—who get support to the extent of 100 percent from either the American Cancer Society or the Public Health Service. You get a much larger picture from the voluntary groups handled that way than would be indicated by this tabulation of these two organizations.

Mr. DOLLIVER. Would it be fair to say that a substantially larger amount for this purpose of cancer research and so on comes from private resources than from tax sources?

Mr. RUNYON. I would think a very substantially larger amount.

Mr. DOLLIVER. Now, there are many, many health agencies in the various States, as well as the Public Health Service. Do you have any information as to whether any activities of this kind are carried on with taxable resources within the various States? For instance, in the State of New York or the city of New York or any other States or cities?

Mr. RUNYON. There have been to my knowledge three States, I believe, which have made appropriations for cancer research.

Mr. DOLLIVER. Could you specify those States?

Mr. RUNYON. The State of California, the State of Pennsylvania, and, I believe, the State of New York.

Dr. RHOADES. I believe that was for internal purposes.

Mr. RUNYON. Well, then, it is two States which have made independent organizations within those States. I know of only two. But, there are appropriations and I do not know the amount. I have no way of knowing the amounts that have been made available by State legislatures for cancer-control work through their own State public-health departments.

Mr. DOLLIVER. Do you have any coordination, or is there any coordination, between the American Cancer Society or the Institute of Public Health—Cancer Institute—coordinating the activities of the various medical schools over the country with respect to cancer research?

Mr. RUNYON. The grants to those medical schools are made through these channels with the coordination which is arrived at through the granting agencies which I have described. In other words, the work which is being carried on at this medical school or at that medical school supported by these funds is pretty well known to these groups.

Mr. DOLLIVER. In other words, the impetus for the research comes rather from the Institute of Health and the Cancer Society rather than the other way? Is that correct?

Mr. RUNYON. I think until 1945 there was very little interest in cancer research around the country, or a relatively small amount of it going on. One of the reasons, I believe, perhaps the principal reason, was that there were no large sums of money available for the support of that research. As some would become available and it was found to be a productive line of research and as discoveries were made and as the conviction became more prevalent that something could be done about cancer, then more and more people who had been trained under our fellowship program went into the field.

Mr. DOLLIVER. You dropped a word there that leads me to this inquiry: Are you able or willing to appraise the effectiveness of these

various grants that are made by your society from funds granted to the various institutions?

Mr. RUNYON. That will be done by others who are better qualified than I am as a layman.

Mr. DOLLIVER. We may anticipate that information?

Mr. RUNYON. Yes, sir.

Mr. DOLLIVER. From what you said previously I understand that none of the funds of the Cancer Society are used for individual curative purposes but are used for research, education, and that kind of thing, rather than taking care of individuals who are afflicted?

Mr. RUNYON. In some of the States there is some direct aid given to cancer patients in extreme cases for payment of hospital bills, medicines, X-rays, and so on. That is a matter on which there is a great deal of difference of philosophy as to whether we should or should not do that with the limited funds available. The question of the 60 percent of the funds retained by the States has not been completely uniform throughout all the country.

Mr. DOLLIVER. Do I gather from that when a campaign is put on—your annual campaign—a portion of the funds which are raised remain with the local cancer society of the State?

Mr. RUNYON. Yes, sir; 60 percent remains in the State and is used by the State.

Mr. DOLLIVER. And that is dispersed according to their own ideas?

Mr. RUNYON. Yes; but in general conformity with the general principles set down by the national society. In other words, they cannot go out and build hospitals and so forth.

Mr. DOLLIVER. The 40 percent which comes to the national society is not under their control, but under the control of the national board of directors?

Mr. RUNYON. Well, 25 percent has to go to research.

Mr. DOLLIVER. That is in your charter?

Mr. RUNYON. That is our basic policy which has been in effect since 1945.

Mr. DOLLIVER. Thank you, Mr. Chairman.

The CHAIRMAN. Are there any other questions at this point?

Mr. MOULDER. We have a State cancer hospital in Columbia, Mo., and I understand that the legislature does make appropriations for the use of the general public and which would include research and the study of cancer diseases?

Mr. RUNYON. But, that is through their own public-health service. You said it was a State cancer hospital?

Mr. MOULDER. Yes.

Mr. RUNYON. As I said, I didn't know what the picture on that is around the country.

Mr. MOULDER. Does the society make any contribution to State hospitals for that purpose? The reason I used that as an example is because you do not think there would be a greater opportunity there to carry on this research study in cancer than at some of the places where it is carried on?

Mr. RUNYON. Well, if there is cancer research going on, that should be supported by the American Cancer Society. The channels of support are now well known. Their application comes to the committee on growth for support of a certain project and if it is approved by

them, it is supported by funds from our national society, no matter where the person is.

The CHAIRMAN. Mr. Runyon, you have made a very complete statement and a very encouraging one, I may say, with respect to organizational work that has been done to bring about cooperation among the several organizations on a Federal, State, and local level and you have made us aware that a number of different organizations such as the American Cancer Society and the Damon Runyon Fund and the National Cancer Institute and the Memorial Cancer Center and other great hospitals and research groups are working together in the field of cancer.

Now, are you in a position to inform us as to how much money all of these groups are putting into various aspects of the cancer problem, and how these activities are coordinated so as to avoid unnecessary duplication?

Mr. RUNYON. Well, I do not think I can tell you how much they are all putting in, because as I made the point a moment ago, the American Cancer Society, for example, gives Dr. Rhoads' organization about $400,000 a year, let us say, more or less, against a budget of $2.5 million or $3 million. The same is true in other organizations which we support, and I have not tabulated what our other sources of revenue are. I do not have any such compilation as that and I cannot tell you the total amount.

So far as the coordination is concerned, it seems to me that that is along the lines which I have described in the way we work with the National Cancer Institute, with the National Research Council, and so on, through the visits which are made to these various organizations where research is being supported, and through the discussions of their programs of research.

In other words, there is a complete disclosure of the work which is going on at each of these organizations to the reviewing bodies.

The CHAIRMAN. Yesterday we had some information before us that would indicate that the difference between sums of money that are being expended by our people for different purposes, such as smoking and liquor and chewing gum, and so forth and so on, and the amount that was estimated that was being spent for some of these things was tremendous.

If I remember correctly, I think there was something like $485 million being spent a year just on chewing gum. Now, I am wondering——

Mr. MOULDER. $254,700,000, Mr. Chairman.

The CHAIRMAN. And there is a lot more in that book of that kind of information that is rather striking when you compare it with the amount that is being expended in research on these different diseases that affect people so generally, and you sometimes wonder how people evaluate the proper way in which to spend money.

As we hear you people speaking and as we know something of the conditions that prevail with reference to these different diseases—conditions of the heart were revealed to us yesterday and cancer is being revealed to us today, and within the next 2 weeks there will be revelations with respect to many other diseases—it seems to be pretty common knowledge that the amount expended to prevent or to carry on timely research is a very small item when we compare it with some

of these other expenditures that stand out so prominently in our national economy.

Dr. HELLER. Mr. Chairman, I might proffer simply as an estimate our figures that about $50 million each year is spent for what we call cancer control and research that we know about, when you add up the existing figures of the Cancer Society, the Damon Runyon Fund. and the National Cancer Institute, and so forth.

The CHAIRMAN. I can only speak for myself in this respect, but when I figure the millions that we are spending on the question of health in this Nation of ours and compare it with the expenditures that we make that go beyond our boundaries and across the seas, they are measured by billions, I wonder sometimes whether we do correctly evaluate the appropriateness of some of the moneys we spend.

It is astounding to me as I listened yesterday and as I listen to you people today, to learn how small the amount is that is actually expended for a matter of this importance. Yet we seem to scatter with a lavish hand billions of dollars elsewhere and forget our own people.

Are there any further questions, gentlemen, before we proceed in the way which Dr. Heller has suggested?

Dr. HELLER. Mr. Chairman, I would like to call on Dr. Paul Wermer, of the American Medical Association.

STATEMENT OF DR. PAUL L. WERMER, SECRETARY, COMMITTEE ON RESEARCH, AMERICAN MEDICAL ASSOCIATION, CHICAGO, ILL.

Dr. WERMER. Mr. Chairman and members of the committee and others, as Dr. Edward J. McCormick indicated in his statement yesterday, our organization includes in its membership physicians from all walks of life—all walks of professional life—and we for that reason are interested in and engaged in a variety of activities.

Cancer, while absorbing and of tremendous importance to every physician, does not represent the association's sole interest in the fight against disease and death.

In line with the schedule of the committee, and which we have adopted for this discussion, I will limit my remarks today to the field of cancer. I will also attempt to avoid repeating information dealing with the description of the disease, its causes, and general research data which has been covered by other witnesses.

I should like, however, to emphasize our realization of the extreme seriousness of this particular disease—obviously a malady which is now in second place among the causes of death and is a matter of present concern not only to the practicing of medicine but to every member of the profession. To each physician, whether family adviser or specialist, every death resulting from cancer is a defeat for scientific medicine. It represents a personal loss; the loss of his patient. Thus, all of us are vitally interested in ascertaining the solution to this problem. We believe, as an organization, that this answer must be found by further education and research. In this manner we hope to determine the causes, the earliest method of diagnosis, the best treatments and the best methods for the early determination of a patient's response to treatment.

We of course are a service organization to physicians and as such we play a very prominent professional educational role. One of our

publications, the Journal of the American Medical Association, goes out weekly to approximately 150,000 practicing physicians in the United States. During the year ending September 26, I would like to review for you what we have done in 1 year on the subject of cancer. The Journal published 21 articles and clinical notes, 156 abstracts of articles appearing in domestic and foreign medical journals. This has been done in its 1952 issues. As I said, 156 abstracts of articles have appeared elsewhere in other domestic journals and also in the general foreign literature, since we have translators in our headquarters who translate these into English, and then we abstract them. We answered inquiries from physicians. I make no count of those inquiries both from domestic and foreign correspondents on the subject of cancer.

In addition, the Journal itself has commented in its editorial columns on cancer in 6 of the 52 issues represented in the survey. In addition, the association publishes 9 special journals monthly, each of which has carried several articles on cancer in the special areas of interest to specialists in certain fields.

At the recent annual meeting of the American Medical Association in New York City this past June, there were 31 scientific papers and 25 scientific exhibits on cancer. In addition, there were 2 nationwide television programs and 5 motion pictures shown to the visiting physicians dealing with this disease. The meeting was visited by approximately 18,000 practicing physicians and over 5,000 students, interns, and technicians. The 18,000 practicing physicians represented well over 10 percent of the total number of practicing physicians in the United States. The students, interns, and technicians were from the immediate neighborhood of New York.

By these educational devices, our publications and our meetings, the American Medical Association brings to the readers of its journals and to its membership, the latest advances in acceptable methods of therapy and diagnosis. We repeatedly emphasize to our members the need to be constantly alert to the possibility of cancer and some of the things that have been emphasized here today, and the need of the physician to be constantly alert to the possibility of the existence of cancer in their patients, regardless of their age, and the necessity for the earliest possible diagnosis of malignancy.

It is axiomatic that the earlier the diagnosis, the more effective are our means of combating cancer with surgery, X-ray, and radium. To this end in 1952 a series of six articles was sponsored by the committee on research. These articles were solicited from leading cancer specialists and were designed to encourage the application of some of the latest methods for early cancer diagnosis in office practice.

At this juncture I would like to note that so far I have been outlining solely the accomplishments of the American Medical Association in this professional educational field. We have outlined chiefly our own activities in the field of professional education and the American Cancer Society has outlined its activities, which are considerable, and by no means do I wish to imply that we are alone in carrying out this task. On the contrary, we are ably joined by the local and State medical societies which make significant contributions in this regard. The State and local medical societies in their medical publications and regular meetings include many discussions, articles and papers

on cancer. Each hospital's medical staff holds conferences and meetings on cancer and other medical problems.

Outside of our association and affiliated groups, the American Cancer Society and its subsidiary State and local societies, there are others such as the National Cancer Institute, the Damon Runyon Foundation and special societies of both lay and professional people too numerous to mention that join us in this task of education of the professional man.

Now, is it your intention, Dr. Heller, to take up the research program later on?

Dr. HELLER. I propose to take that up next.

Dr. WERMER. Well, then, you would not want me to mention our activities in research until the others have had their opportunity, I presume?

I think I would like to add just two more statements. One is that the committee has shown obvious interest in the distribution of physicians in the United States and in the distribution of facilities for diagnosis in the United States and I should like you to know that our Bureau of Medical Economic Research has drawn up an article in which comments are made on the subject and there is a series of maps which give the exact distribution of physicians, medical facilities, and so forth, in the entire United States, which I believe would be of great use to this committee in its study of a future medical problem.

Now, that is available for use of the committee. It is our Bulletin 94–A and we will submit that to you.

The CHAIRMAN. We will be glad to have that and may I see it?

Dr. WERMER. I should call your attention to page 4, which contains a general map of the entire United States, and then in the back of the book you will find State breakdowns—individual State breakdowns—showing the distribution of facilities and physicians.

In addition, I heard that the committee was interested in medical education and in the output of physicians during each year. Our council on medical education has drawn up a fact book on medical education. The 1953 edition was recently published and contains very pertinent information on the supply of physicians and how it is increasing each year. which I believe would also be of interest to the committee and of use to it in its study of the total problem.

The CHAIRMAN. May I have that?

Dr. WERMER. I believe you have supplies of that at present. (AMA Bulletin 94A and the fact book on medical education have been placed in the committee files.)

That concludes my remarks.

(Dr. Wermer's prepared statement follows:)

STATEMENT OF THE AMERICAN MEDICAL ASSOCIATION RE CANCER DIAGNOSIS, TREATMENT, AND RESEARCH, BY PAUL WERMER, M. D.

Mr. Chairman and members of the committee, I am Dr. Paul Wermer of Chicago, Ill. For 6 years I was a practicing physician in New York City. Thereafter I served for 5 years in the United States Public Health Service, after which I spent 4 years in clinical research work in the pharmaceutical industry. Since 1949 I have been the secretary of the committee on research of the council on pharmacy and chemistry of the American Medical Association. I am appearing here today as a representative of that association to outline our activities in the field of cancer diagnosis, treatment, and research.

As Dr. Edward J. McCormick indicated in his statement yesterday, the American Medical Association includes in its membership physicians from all walks of professional life and is interested and engaged in a variety of activities. Thus, cancer, while absorbing, does not represent the association's sole interest in the fight against diseases and death. In line with the schedule of the committee, I will limit my remarks today to the field of cancer. I will also attempt to avoid repeating information dealing with the description of the disease, its causes, and general research data which has been covered by other witnesses.

I should like, however, to emphasize our realization of the extreme seriousness of this particular disease. Obviously, a malady which is in second place among the causes of death is a matter of pressing concern not only to organized medicine but to every member of the profession. To each physician, whether family adviser or specialist, every death resulting from cancer is a defeat for scientific medicine. Thus, all of us are vitally interested in ascertaining the solution to this problem. We believe that this answer must be found by further education and research. In this manner we hope to determine the causes, the earliest method of diagnosis, the best treatments, and the best methods for early determination of a patient's response to treatment.

In the field of cancer diagnosis, treatment, and research, the American Medical Association plays a prominent professional educational role. The Journal of the American Medical Association is prepared and distributed weekly to close to 150,000 practicing physicians. During the year ending September 26, 1953, the Journal published 21 articles and clinical notes, 156 abstracts of articles appearing in domestic and foreign medical journals, and answered a number of inquiries from domestic and foreign correspondents on the subject of cancer. In addition, the Journal has commented editorially on cancer in 6 of the 52 issues represented in this survey.

In addition, the association publishes nine special journals monthly, each of which has carried several articles on cancer in the special areas of interest.

At the annual meeting of the American Medical Association in New York City this past June, there were 31 scientific papers and 25 scientific exhibits on cancer. In addition there were 2 nationwide television programs and 5 motion pictures shown to the visiting physicians dealing with this disease. The meeting was visited by aproximately 18,000 practicing physicians and over 5,000 students, interns, and technicians.

By these educational devices (our publications and our meetings) the American Medical Association brings to the readers of its journals and to its membership, the latest advances in acceptable methods of therapy and diagnosis. Editorially, we repeatedly emphasize to our members the need to be constantly alert to the possibility of the existence of cancer in their patients regardless of age, and the necessity for the earliest possible diagnosis of malignancy. It is axiomatic that the earlier the diagnosis the more effective are our means of combating cancer with surgery, X-ray, and radium. To this end, in 1952 a series of six articles were sponsored by our committee on research. These articles were solicited from leading cancer specialists and were designed to encourage the application of some of the latest methods for early cancer diagnosis in office practice.

At this junction I would like to note that so far I have been outlining solely the accomplishments of the American Medical Association in this professional educational field. By no means do I wish to imply that we are alone in carrying out this task. On the contrary, we are ably joined by the local and State medical societies which make significant contributions in this regard. The State and local medical societies in their publications and regular meetings include many discussions, articles, and papers on cancer. Each hospital's medical staff holds conferences and meetings on cancer and other medical problems.

Outside of our association and affiliated groups, the American Cancer Society and its subsidiary State and local societies, as well as the National Cancer Institute, the Damon Runyon Foundation and special societies of both lay and professional people too numerous to mention join in this task.

The association has been equally interested in the field of cancer research. For the past 6 years we have supported, with the cooperation of representatives of the drug industry, a far reaching survey of the effects of certain sex gland hormones and allied substances upon the course of various forms of cancer. We became interested in this program because it offered promise of a method of treatment, within the skill of most physicians, which would permit office or home care for the long-term cases of inoperable cancer of the breast, prostate gland, and possibly other organs.

In 1946 when this program was inaugurated, only a few breast cancer cases, treated with these endocrine substances, had been reported upon. It was imperative to learn as quickly as possible the efficacy of these agents, the best dosages and the possible hazards in this therapy. It was obvious that no one physician or clinic could see enough cases in a relatively short period of time to accurately assess the problems outlined. It was equally obvious that if the benefits of this treatment were to devolve to patients suffering from cancer as quickly as possible, it was necessary to organize a cooperative study involving many clinics and investigators.

The subcommittee on steroids and hormones of the committee on research undertook the organization and conduct of such a study. It is not my intention to comment on the mass of data which has been accumulated; however, certain pertinent facts concerning this study deserve mention. In all, 45 clinics and 65 investigators joined in the task. They deserve the majority of the credit for the results achieved. The pharmaceutical industry has also been extremely cooperative in supplying large quantities of expensive and, in some instances, rare substances for distribution through the committee to investigators without charge. The American Medical Association bore all of the administrative costs plus the costs for biennial meetings, including travel of all investigators.

This subcommittee was faced with problems of standardizing as far as possible the selection of proper patients for treatment in the various clinics. From their own experience, the members devised varying dosage schedules and designated the clinics which would use them. The investigators were furnished with standard forms so that their reports would be as uniform as possible. These reports were filed quarterly and the data were analyzed by the office staff of the committee on research in Chicago. Thus, in a relatively short time the medical profession was in possession of definite criteria for the selection of patients for this form of treatment plus definite dosage schedules which met the needs of the majority of their patients. In this way the dangers inherent in the therapy were also discovered in advance. This was accomplished by seven committee publications in the Journal of the American Medical Association and approximately 100 individual publications.

It may be of interest to the committee to know that over 2,000 inoperable breast cancer cases have been registered and treated. At the present moment an analysis of the total data accumulated is in progress with a view to the publication of the results as a series of monographs. Currently substances are being tested in the hope of finding more effecttive compounds with fewer side effects. The studies themselves have been widened to include cancer of the female and male sex organs, the urinary bladder, the thyroid gland, and certain bone tumors. We should like to emphasize that each of our investigators is still a free agent. They are not bound rigidly to our organization. Each is free to conduct other research projects for other agencies even upon the forms of cancer in which we are primarily interested. All we ask of the collaborating investigators is that they report their results to our central office. These results are then disseminated among other investigators by means of bulletins and letters. Thus, it may be seen that the primary effort of the American Medical Association as well as those of many other medical societies is toward the expeditious exchange of scientific and objective medical information.

The road to the solution of the cancer riddle is not an easy one since we know little about the actual cause or causes of this group of diseases. It is also unfortunate that all the problems in regard to cancer are not on the positive side, that is imposed by the disease. There is instead a venal, negative side, with problems which are man made, created by those who seek commercial gains by foisting false hopes and cures on the cancer patient and his family. For over half a century the American Medical Association has shown bold leadership in opposing these forces. During this time we have maintained an agency for the collection and dissemination of information on nostrums and quackery. We feel this task to be a public duty in order to protect the laity and to furnish physicians with objective evidence as to the lack of value and the identity of the secret nostrums proposed as cures.

In this endeavor the association, through its bureau of investigation, has cooperated closely with the various Federal and State agencies charged with the enforcement of laws regulating the drug industry. We have also cooperated with the State agencies which have jurisdiction over the licensing of individuals who seek to follow either the practice of medicine or the other healing arts.

In turning the searchlight of truth upon these cancer quacks we have frequently become the defendant in a court of law. Thus, the association has been obligated to spend large sums of money in the defense of such legal actions. It is significant, however, to note that although we have been sued for more than $40 million over the years, we have been obliged to pay but one judgment and that, in the nominal sum of 1 penny.

This is a constant battle in which we have chosen to remain in the forefront. Even now several nostrums are being promoted to the public either on representation that cures are obtainable or that the proponents are experimenting clinically with something new and valuable in the management of cancer patients, particularly those beyond the conventional methods of treatment used by medicine.

In our efforts to educate and evaluate, we have been joined by the American Cancer Society, the National Cancer Institute, the Damon Runyon Foundation and the Food and Drug Administration in sponsoring the National Research Council's committee on cancer diagnosis and therapy. Inasmuch as the work of the latter committee will be described in detail by other witnesses, suffice it to say that it gives the Nation a sound method of evaluating proposed cancer cures and diagnostic aids. It is the intentioin of our association to encourage and further every honest attempt to increase our knowledge about cancer, to continue our earnest efforts in the quick dissemination of such knowledge to our physician members and to foster the type of cooperative research program previously outlined.

This concludes my formal statement. I want tto thank the committee for allowing our association an opportunity to testify on this most important subject. I shall be happy to answer to the best of my ability any questions which members of the committee may have.

Dr. HELLER. Thank you, Doctor.

Mr. Chairman, do you or the other gentlemen have any questions to be asked Dr. Wermer?

The CHAIRMAN. Are there any questions, gentlemen?

Mr. DOLLIVER. I should like to interpolate and ask a question here of Dr. Rottino, which should be placed back where you mentioned Hodgkin's disease.

I am ignorant enough that I do not know what that means.

Dr. ROTTINO. I stated it was a special form of cancer. As was emphasized this morning, carcinoma is a general disease and there are many forms of cancer. One of them is Hodgkin's disease. Hodgkin's disease is a type of cancer that affects the lymph nodes of the body.

Mr. DOLLIVER. The lymph nodes?

Dr. ROTTINO. Yes. There are numerous lymph nodes in the body. It is of particular interest that whereas other forms of cancer attack individuals over 45 to a greater extent, in Hodgkin's disease we see that the younger population is affected.

Mr. DOLLIVER. Thank you.

The CHAIRMAN. Is that a disease of the blood, Hodgkin's disease?

Dr. ROTTINO. No; of the lymph nodes.

The CHAIRMAN. That is beyond me. If Mr. Dolliver understands what that word is, I do not.

Dr. ROTTINO. Perhaps if I use the word lymph glands it might be more understandable.

The lymph glands are small collections of cells which are present beneath the skin and other places in the body. Their essential function, apparently, is to protect the body against disease in general, and in this particular system it constitutes a complicated system scattered all over the body. It is often described as the first line of defense against disease.

The CHAIRMAN. I have a lot of respect for my colleague who knew that and who does not have to display ignorance such as I have displayed.

Having in mind the situation that was revealed with Senator Taft, what situation was that which apparently worked so quickly from the time that he first went to the hospital until he died; what is that type of cancer?

Dr. ROTTINO. I am not acquainted with the facts.

The CHAIRMAN. Pardon me?

Dr. ROTTINO. I am not acquainted with the facts of Senator Taft's condition.

The CHAIRMAN. Neither am I. I thought possibly that you gentlemen would be able to give some explanation of that because, to a layman, that is a very unusual situation where Senator Taft was apparently in good health, went to New York and took an examination, and it developed so seriously within such a short time. Is there anyone who knows the situation there?

Dr. HELLER. I believe Dr. Rhoads may know something about it, Mr. Chairman. Dr. Rhoads.

Dr. RHOADS. Yes, I was his doctor, or one of the doctors attending him.

I think, Mr. Chairman, I am free to speak because his son made an announcement shortly after the patient's death which included the salient facts of the case.

Mr. Taft developed nodules under his skin in June. He had been under the care of certain physicians before that time, but they had not located the source of the symptoms.

The first recognition of the problem as one of cancer was when these lumps under his skin were perceived by doctors in Cincinnati.

The skin was incised and the tissue comprising the lump was removed and suitably treated chemically so that it could be examined under the microscope. This was a biopsy which was done. It was examined by no less than 15 pathologists, all competent in the classification of cancer, and all agreed that this was cancer, carcinoma, which means a very rapidly growing type, which was widely scattered throughout the body. So, there were a number of lumps in a number of different places in the body.

The cells comprising these lumps were so different from normal cells in their appearance that it was not possible to tell from what organ within the body these cancer cells arose and had developed throughout the body, under the skin and elsewhere.

To establish the site or origin of these cancer cells which had scattered throughout the body, an operation was done at the New York Hospital, and I concurred in the opinion of a number of consultants in going forward with the operation.

At the operation the abdominal cavity was found to be full of cancer, and this was so extensive they could not tell at that time from what organ within the abdominal cavity the cancer arose. It was hoped that we could tell from what organ it arose and on that basis might be able to institute some chemical treatment which would slow the growth of the cancer. However, that was not possible.

A post mortem examination was made, and the weight of the evidence is that this arose in the pancreas, a large mass of tissue below the stomach, which secretes digestive juices, and pours them into the

intestinal tract. The pancreas is commonly a source of cancer which is very hard to control by surgical and other means.

This is one of the best examples, Mr. Chairman, of the problem that Dr. Cameron referred to as comprising 50 percent of the patients with cancer, and of those patients whose disease has already spread widely throughout the body before the diagnosis is made, and for the aid and cure of whom we must have better methods, and we must have something like penicillin for cancer, and that is what we are fighting for.

The CHAIRMAN. That is all very interesting.

Of course it is outstanding cases that probably attract more attention than any others, such as the cases of Senator Taft and Senator Vandenberg. When we see men of that type stricken down it does have a tendency to create an interest on the part of the public. Whatever may have been the situation with respect to Senator Vandenberg his case was more prolonged and apparently did not create the publicity that would arise from a case such as Senator Taft's which acted so quickly from beginning to end.

Dr. MEADER. There were also the cases of Senator Wherry and Senator McMahon, Mr. Chairman.

The CHAIRMAN. Yes.

Are there any questions, gentlemen?

Dr. HELLER. Mr. Chairman, with your permission, I would like to call upon Dr. Rhoads to discuss the clinical research picture with some indication by him of the advances which have been made in clinical research in cancer, and which points up some of the very vital questions which have been put to the panel this afternoon.

The CHAIRMAN. Am I correct, Dr. Rhoads, in saying that your institution probably carries on about 20 percent of all research in cancer?

Dr. RHOADS. Mr. Chairman, that figure could be used, or could be arrived at by dividing the total research expenditures of $15 million a year by the amount spent at our institution for research. That figure of our expenditure on research is $3 million. That is where the figure of 20 percent, I think, perhaps, was arrived at.

The CHAIRMAN. When you give figures like that it makes me feel terribly ashamed that in this Nation of ours in a matter of this kind that there are limitations such as you have just mentioned.

Dr. HELLER. Dr. Rhoads.

Dr. RHOADS. Mr. Chairman, you have charged us at the outset with three requests, that we define for your committee what is being done, where we are, and whither we are going, and I have been asked to take over clinical research as my segment of the answer.

By clinical research I refer to those aspects of research work which are potentially or directly applicable to the relief or the cure of cancer in human beings.

Dr. Cannan will speak of the basic research which gives us new principles of physics and chemistry which we must have for conversion and application to the care of human beings.

I would like to add to this tripartite charge one more, and that is where we have been, recalling that we are now taking an active part in an 80-year war against cancer.

This began in 1874 with the first recognition of the problem in cancer in human beings as deserving attention, when the first cancer

hospital in this country was established in New York City in 1874, and it took 60 years for the next move to be made, and that move you yourselves made with your committee in bringing about the legislation which led to the National Cancer Act of 1936, and the work of that began in 1934, stimulated in substantial part by my predecessor, Dr. James Ewing, whom I am sure you will remember.

Then came the National Cancer Institute and the war. During the war certain new information of a scientific nature came to hand which suggested very strongly to those of us associated in that scientific work during the war that chemical means might well be found which would yield better control and eventual cure and some aid to advanced cancer in human beings than cancer treatment by surgery or by X-rays.

There were instituted changes in policy by the American Cancer Society to solicit funds publicly and to do research, a change in organization to which Mr. Runyon referred.

That was the 50th year, and we come here at the end of the 80th year which is to my mind at the end of the 1st decade of a shooting war against cancer and the 8th decade of police action.

Now, you have asked us to speak to the question of the burden upon individuals, financially mainly, imposed by this disease. You have heard a very impressive series of statistics.

The institution I represent is composed of two cancer hospitals, the Memorial Hospital, and the James Ewing Hospital, the latter constructed and financed and put in operation by the State of New York, but staffed and controlled by the Memorial Hospital by agreement with the city of New York.

It is part of the so-called Medical Center of the New York Hospital Association, and a coordinated body of 8 members unifies the policies of the 4 institutions, the Memorial Hospital, the James Ewing Hospital, the Sloan-Kettering Institute, Cornell Medical College and the New York Hospital.

The two hospitals at the memorial centers have 500 beds for cancer purposes, one of the largest collections of beds exclusively for cancer that there is in this country.

There is also available a substantial number of beds for cancer patients in the New York Hospital, a general hospital of 1,000 beds, of which 100 beds are constantly occupied by cancer patients.

As far as cancer is concerned we have 10,000 patients annually with cancer. This is roughly from 2 to 5 percent of the patients of the country, and it is probably nearer to 2 percent than 5. We do not know, and cannot arrive at the occurrence of cancer because many of the States do not report cancer except for deaths.

In my 14 years there, there have passed through our institution something over 100,000 patients with cancer.

We have no other problem than cancer, and a certain number of these patients, a very considerable number, have shared their mental and their financial problems with me in my office, and I can assure you that I can recall no one who has not been previously embarrassed financially and deeply distracted mentally by this illness.

The cost of the hospitalization of our 10,000 patients annually is between $4 million and $7 million. I am indefinite as to the exact cost of the Ewing Hospital which is on a different accounting basis than ours is, and we estimate, therefore, that the cost of hospitaliza-

tion in this country must be approximately between $300 million and $500 million which somebody has to pay, and that is a very serious burden.

That figure, incidentally, I believe to be low rather than high.

The CHAIRMAN. That is entirely for cancer?

Dr. RHOADS. Yes, sir; entirely for cancer. This is a very rough figure quickly calculated and prepared this morning in response to your question.

We organized and put into operation the first clinic in the country for the examination of women individuals for the presence of cancer, the Strang Clinic. It still operates, and I think it has been a very useful experiment. It does pick up, as Dr. Cameron stated, about 1 percent of the examinees with cancer.

You might say this was instituted against great skepticism on the part of my professional associates in 1940.

We operate a research institute which has a direct budget of just under $3 million. It is operated with Burroughs Wellcome Laboratories in Tuckahoe, N. Y., which supplies chemicals to the Southern Research Institute in Birmingham, Ala.

We do not have an accurate figure of the expenditures in these affiliated organizations.

There are also 42 contracts with pharmaceutical, university, and chemical laboratories for the production of chemicals to the best of their ability to control cancer in human beings and in animals.

In short, this is an example of what has happened in the 10-year shooting war which has gone on since 1944, and there are many other examples throughout the country.

You have asked us to tell what we have learned in this 10-year or 20-year active scientific enterprise. I think that very substantial advances have been made.

We can divide the work into two main divisions: (1) Efforts to achieve a more adequate cure of cancer in man, and (2) efforts to achieve a knowledge of the cause and its removal, with ultimate cancer prevention in man.

Studies leading to cure can be divided into two segments: (1) The curing of patients with cancer, localized to the tissue in which it arose, or nearly localized to that tissue, and in the second division, efforts to control or cure patients with cancer which has spread far beyond the organ in which it arose, as was the case with Mr. Taft.

In our scientific efforts to achieve better control or cure of cancer and still comparatively localize it to the organ of origin we have two jobs, one of which is to achieve earlier diagnosis, about which Dr. Cameron has spoken, and the other is to achieve better methods of removing the cancer in its entirety and so to achieve a cure.

Dr. Cameron has previously referred to the success of the educational program in bringing patients earlier to the doctor while their cancer is still localized.

I have followed his reports with the greatest of interest and I would like to point out that without his energy and inspiration these programs would not have existed as they have.

I would like to cite one example, that of the State of Vermont, where early apparently curable cancer has risen from roughly 30 percent to 37 percent, and will you correct me, Doctor, if that is not correct?

Dr. CAMERON. That is correct.

Dr. RHOADS. And there are other examples of this extraordinarily effective program. We want to do a better job of removing and curing cancer, and that is being done.

Modern procedure has apparently increased the rate of cure of cancer from roughly 15 percent to roughly 50 percent.

In the case of cancer of the breast the figures are roughly from 40 percent to 50 percent under the best circumstances, and the cure rates for cancer of the stomach, low as they are, are substantially better than they were a decade ago.

Also for cancer of the womb a substantial improvement has been had within the last 10-year period.

So, real advances have been accomplished, and they have been accomplished by the most assiduous and vigorous scientific work. It has often been due to new chemical principles derived from laboratories apparently with no connection to cancer, but brought to application by those who are concerned with cancer in human beings.

As to cancer which has spread out from the seat of origin, we do not have any chemical cure today.

We do have much better means for bringing about relief to many patients with widely disseminated cancer than we had a decade ago. It is possible in the case of cancer of the breast, where the disease has gone far beyond surgical treatment, to bring about resistance to the growth of the cancer for periods of from months to years in from 25 to 40 percent of the instances.

In the case of cancer of the prostate, thanks to the work of the group in Chicago we can bring relief to men who have very advanced conditions, whose limbs have become contracted by the pain, in 80 percent of the cases by the institution of chemical treatments.

Now, this is not a cure, but it is a very welcome surcease to patients for months or years.

In the case of Hodgkin's disease, as Dr. Rottino has told you, we can expect to alleviate the symptoms in roughly 80 percent of the previously uncontrolled patients for months, and prolong relief to some for years.

In the case of leukemia, cancer of the blood stream, we have also made a contribution. We can now bring relief to a substantial number of patients with these disorders. We can keep them in comparative health and comfort for weeks and months and sometimes for years.

Now, that is where we are at the present time.

We have the organizations, we have the institutions, and we have support, and we hope to have more and more adequate support and more and more adequate staffs.

Now, what does the future hold? Whither are we going?

I believe sincerely that the problem is now well analyzed, and there can be a more orderly effort to achieve cancer prevention and cancer cure in man.

We will have better and better curatives for localized cancer and we will have more and more adequate diagnostic measures and we will have more and more adequate and less hazardous surgical and X-ray problems. Inevitably, as I see it, from the work of Dr. Farber and many other groups, including our own, we can look forward to something like penicillin for cancer, and I hope within the next decade that we can achieve that.

It seems to me that we know how to proceed quite as well, or rather better than did the bacteriologists just before the discovery of sulfanilamide. I can look back to that day with great interest. I lost my finger when my best friend was on his way home from England with sulfanilamide coming to this country.

Then we never dreamed that there would be chemical means of clearing up these widely spread infections. I believe we will have in the next decade perhaps chemicals which are as effective against cancer as sulfanilamide and penicillin today are against bacterial infection.

Dr. HELLER. Mr. Chairman, since Dr. Farber is so very closely associated with this same area that Dr. Rhoads is, may I have permission to have him make a statement for the benefit of the committee? If he will, I would like him to discuss one disease and the application of clinical research to it.

The CHAIRMAN. I shall be very glad to follow your suggestion. However, I cannot let the opportunity go by to say how gratifying this statement of Dr. Rhoads has been because of the promises as to the future, being an opinion expressed by a man who has devoted so many years to this subject and has made such a great contribution in this field. I may say, Doctor, that the testimony that you have just given is extremely gratifying to hear.

Dr. HELLER. Dr. Farber.

Dr. FARBER. Mr. Chairman, and members of the committee and others, Dr. Rhoads made mention of one point which I would like to begin with. He made mention of the fact that cancer research makes use of knowledge and talents that come from many different fields, and I would like to suggest a little enlargement on that point so that I can make the point that while we are talking about cancer, and while we are talking about the great progress in the last number of years that has come about because of institutions and organizations and the prevention and treatment and cure of cancer, it is quite clear that we use knowledge from all fields, many fields representing colleges and the National Institutes of Health, and the medical schools of the country. On these basic sciences we depend completely for the next steps and the kind of research that Dr. Rhoads mentioned.

Dr. Heller has asked me to take up this discussion of one phase of cancer research today which has been applied to the patient, and it is an excellent example to bring out what has been mentioned before to you, the 50 percent of patients with cancer who must die today because we do not know enough to treat them properly, because there has not been enough research to supply answers for these patients.

This example is leukemia, and may I define it as cancer of the white blood cells in the acute form. There is a chronic form too.

In the acute form there is an increase of a number of cells of a type which we find in the embryo, in the very small fetus, early in uterine life. This multiplication of cells takes place in the blood stream and a great many kinds of tissues of the body; virtually every part is involved.

The acute form is found mainly in children, and the chronic form is found mainly in adults.

This obviously is a disease which cannot be cured by the surgeon. Neither can it be treated effectively in the acute form, by the use of

irradiation, and those are still the two main tools we have in attacking any problem of cancer in the human body.

This is work which was begun by the great work of the Cancer Institute and a number of institutions of the country, this concept of the use of a chemical compound which may be taken by mouth, which might affect not only acute leukemia but cancer of the breast, the prostrate, the intestines, or the brain.

When I say chemical in this connection I might use the word "hormone." Now, the results of this work came from laboratories, from cooperation of chemistry and bacteriology in laboratories and colleges and medical schools, and the pharmaceutical industry far removed from the patient, and I want to emphasize again that without the support of these basic workers such a necessary step could not take place.

Dr. Rhoads has mentioned the splendid cooperation from the pharmaceutical industry which has rich resources in manpower, talent, and equipment and money which is contributing to the benefit of those who are interested in cancer research.

In the case of acute leukemia, beginning in 1947, there was the first marked change in the treatment involving administration of chemical compounds related to a vitamin, but different in a very important biological way from the basic vitamin because of its effect in prolonging the life of children with acute leukemia.

Since that time in several laboratories and clinics there have been advances made with the use of ACTH and cortisone and with other chemical compounds totally unrelated to the first group, and with all of these techniques today we are able to control acute leukemia in children more successfully than ever before.

The point I wanted to make was that despite these great advances this form of cancer is still incurable.

We are able to reduce the pain for long periods of time, and we are able to increase the period of survival of these patients, and we have reached into a condition which used to cause death after a few weeks or months, and we are able to extend survival for a year or 2 years. The longest survival we have is that of a little boy, and it has been 2 years and 4 months since the onset of his leukemia. However, he is still suffering from acute leukemia which may arise at any time to end his life.

We are also interested as a result of the atomic bomb with which leukemia has been produced in those individuals who have the proper substrata for leukemia, and we may expect a great deal more should there be an increased use of that weapon.

X-ray men have 8 or 10 times the leukemia of doctors in general, showing that those who are exposed for long periods of time to the action of X-rays may have a condition or stimulus which results in the production of acute leukemia.

I am not going to carry on this discussion any farther trying to give other examples. This is similar to the examples Dr. Rottino described in Hodgkin's disease.

In the last 8 or 9 years men in a number of places, Dr. Rhoads' group, and people in Chicago, have administered compounds which originally came from the war gas, nitrogen mustard, thus using it in a much more effective way in an attempt to prolong life. That move,

as a matter of fact, was the starting point of this whole modern way of treatment of human beings with cancer by chemical agents.

I wonder, Dr. Heller, if I may continue for just a moment so that I will not interrupt later on, and comment on one of the points which the chairman was obviously considering this morning. May I return to the question of the number of hospital beds? In the first place, I would like to agree with Dr. Rhoads' estimate of the tremendous cost of hospitalization of all patients affected with cancer in the country. This is in addition to the amount of money which has been given through the National Cancer Institute and other organizations such as the American Cancer Society and the Damon Runyon Fund, for research in stimulating better care and developing new methods of treatment.

However, I think in answer to your question, Mr. Chairman, any bed in the country is a cancer bed, just as any doctor in the country is interested in the subject of cancer, not only those who work in the cancer field themselves. I would like to say that when you speak of a hospital bed you must not only put the patient in the bed, but surround him with doctors who are properly trained and a sufficient number of nurses and technicians and all of the other medical workers who are needed to give that patient with cancer the kind of care that is given to the patient in those hospital centers where the best kind of cancer care is given.

I will say in direct answer to your question, and I will speak as a doctor interested in the care of patients with cancer, that there are certainly not enough beds in the country, nor are those who have cancer in the position throughout the country to pay for this perfectly tremendous cost of medical care when they have months or even years ahead of suffering from cancer.

I would like to record that as one man's experience and one man's opinion.

The CHAIRMAN. When you speak of basic research you are speaking of a subject that this committee has already shown great interest in because it is through this committee that the National Science Foundation was formulated, both legislatively and otherwise. So, we are very pleased to hear you speak in the terms which you do about basic research.

Mr. Dolliver.

Mr. DOLLIVER. You referred to the disease of leukemia as a cancerous condition of the white blood cells. Would you differentiate that from the disease anemia which also is a disease of the white blood cells?

Dr. FARBER. The word "anemia" is a general term which refers particularly to a reduction in the number of red cells and more generally to a deficiency of the bone marrow and those portions of the body which manufacture red cells or other cells which we require.

In leukemia the bone marrow is destroyed or replaced by the cells of the white source. There is no room for the production of adequate numbers of red cells. So, anemia is one of the more important symptoms of leukemia. Anemia, generally speaking, is much broader. That may be broken down into specific classes. One of these is called pernicious anemia. That one can be kept under control for the lifetime of a patient by the use of liver and liver extracts or

other substances. There are many different causes of anemia as there are many different kinds of cancer.

Mr. DOLLIVER. Am I correct in thinking that leukemia and anemia are two separate and distinct things?

Dr. FARBER. Yes.

Mr. DOLLIVER. May I address a question to Dr. Rhoads?

The CHAIRMAN. Yes, certainly. I have been impressed with your knowledge of medicine and any questions you ask, I assume, will add to your knowledge.

Mr. DOLLIVER. I very quickly admit I need to add to my knowledge, Mr. Chairman.

In one comment that you made, Dr. Rhoads, you said that there was some stimulus given to the search for a specific chemical control of cancer by the experience gained during World War II. I would be glad if you would care to develop that idea and trace the source of that renewed interest.

Dr. RHOADS. The stimulus should have followed World War I, but people were too uninterested in cancer to see that obvious control which was under their noses.

There was organized during World War II a Medical Division of the Chemical Warfare Service.

Its mission was to study the way in which poison war gases exerted their injurious effects so that we could devise means for protecting our troops. I may say we had in mind means of taking specific hills without any casualties, but they were never employed.

Mr. DOLLIVER. Am I correct in saying that during World War II no poison gases were used in combat?

Dr. RHOADS. That is correct, yes, sir, except by accident.

Mr. DOLLIVER. Yes.

Dr. RHOADS. On the night of December 3, 1943, Bari Harbor was bombed. We were unloading munitions that night there, and there were some 14 ships at the mole discharging. One of them had aboard a cargo of airplane bombs, and that included 100 tons of M-I bombs, charged with mustard gas. We had stocks of chemically charged munitions on the European front in case gas was used against us. The harbor was a mass of flame, and over a thousand men were in the water because a whole series of ships went up in the explosion. Men were pulled out and sent to 2 hospital stations under the charge of 2 different medical officers. They were covered with oil and suffering from submersion.

One medical officer cleaned the oil off before he put the men in warm blankets and gave them the customary treatment.

The other officer did not do so. All of the men in the second group died and none of the men in the first group died. I had a very good officer, Colonel Alexander, who was then in the North African theater. We heard about this, and we made post mortem examinations of the men who died, and the tissues were sent back to our laboratory at the Edgewood Arsenal by regular channels also and subjected to pathological examination. It was quickly apparent that the men had died because all of the cells normally forming the white blood cells, that is, the structural units and the bone marrow and the lymph glands, had been destroyed. We should have known this before, but we did not.

There had been a suggestion of this right along. That led to consideration of the possibility that since there were forms of cancer

arising in blood-forming tissues of lymph glands, as Dr. Farber has explained, and since these war gases destroyed the normal blood-forming cells, they might destroy cancer arising from those blood-forming cells.

We had under contract with us Dr. Gilman and others—Dr. Phillips at Yale University—working for the Chemical Warfare Service. They had a patient who had an advanced cancer of the lymph glands of his neck. These are the glands that swell up when you have a sore throat. You can feel them in your neck. This was so extensive it was blocking off his windpipe and threatening strangulation. They could not make a hole in his windpipe because the cancer was too far down. He agreed to have a test dose of one of the mustard gases used. This was administered and his cancer simply melted away, within a matter of hours or a few days.

That was the first trial of a mustard derivative in the treatment of cancer in human beings.

Mr. DOLLIVER. What was the approximate date of that?

Dr. RHOADS. 1943.

Mr. DOLLIVER. 1943.

Dr. RHOADS. As I recall it. Either late 1942 or 1943. I have forgotten for sure.

Then we extended the work to Chicago, where Dr. Jacobson made the first observation of this first same effect, operating in Hodgkin's disease.

All this work was done under Army contract with the division.

We then put out the chemicals under military security to a number of hospitals which wished to cooperate, still under military security, and had a rather extensive clinical trial. That was against various kinds of cancer by the time the war ended. This was done with the understanding and cooperation of the National Research Council, as Dr. Cannan recalls.

We were able to report not long after the war, when security was removed, trial in a very large number of institutions, which gave us sound information completely reproducible on what these chemicals would do and what they would not do, and some information on their mode of action, which has led to the whole program of synthetic preparation of similar chemicals, related chemicals, and a knowledge of the kind of chemicals you might predict would have some of the effects Dr. Farber specified.

As he says, I think this was the key. We had all been groping for this, which gave us for the first time at least some little rational basis for a program of seeking for a penicillin for cancer, which we have not found yet; but I hope we will.

Mr. DOLLIVER. This series of events which you have now related is the basis for your hope for a penicillin, as you say, for cancer, I take it?

Dr. RHOADS. Yes. There is lots more information now, much of it derived from Dr. Farber's studies, suggesting this is not an unreasonable hope.

Mr. DOLLIVER. If Dr. Farber has anything to add I would certainly be glad to hear it, because this whole area of discussion, Mr. Chairman, is something quite new to me. I had not realized that this phase of cancer had developed to the point where it apparently has.

Dr. RHOADS. Certain very striking psychological hurdles have been surmounted now. A. We know these effects Dr. Farber refers to

can be exerted in animals and human beings. B. We have good test objects by which we can assay the ability of newly synthesized chemicals and select for injurious effect upon cancer and normal cells. C. We have a little understanding of how they work and we can institute a program of synthesis on a semirational basis today.

I think most important of all, we have very real knowledge that the cancer cells do not differ in certain respects from other cells, and so should be susceptible to selective attack. We can show this in the test tubes, with experimental animals and to a limited extent now in human beings.

Mr. DOLLIVER. Would you have any idea how many different chemicals you have tested in this research? Would it run into the hundreds?

Dr. RHOADS. Our group has tested 10,400 pure chemicals and 7,000 crude abstracts of natural materials; yeasts, molds, running all the way from grapes and apple parings to mushrooms from Western Germany. There are natural materials such as these mushroom strains, active agents, which will restrain today cancer in experimental animals. Whether they will ever restrain cancer in man I do not know, but everything looks as though we could hope for more effective means for cancer control in man.

A note has been handed to me pointing out that the committee is going to visit New York. Of course we would be happy to demonstrate the operation there at any time you can be in New York.

Mr. DOLLIVER. Do you have anything to add to that, Dr. Farber?

STATEMENT OF DR. SIDNEY FARBER, CHILDREN'S HOSPITAL, BOSTON, MASS.

Dr. FARBER. I might say, Mr. Chairman and Mr. Dolliver, that we have at the present time in a number of institutions in the country a large number of patients with advanced cancer, incurable by other methods, who are receiving these chemical compounds which have been proved to be safe for use in man on the basis of animal experimentation. This is one of the great fields of development at the present time.

In the field of leukemia, Hodgkin's disease and the lymphomas these chemicals have had their greatest use so far. The hope is that these chemicals which we have today, or similar ones, may be found effective against other forms of cancer in man.

I might say a word of appreciation to the congressional Committees on Appropriations which studied some of the questions we are discussing today. They made special provision for the support of research through the National Cancer Institute, and in the last appropriation particularly concerning the use of chemical compounds in the treatment of leukemia and allied diseases. It is hoped that this special support carried out in a very well-regulated cooperative program throughout the country and through the National Cancer Institute will be enlarged in the course of time to take in other forms of widespread cancer.

Mr. DOLLIVER. I am reminded that the Federal Government has a large program of remedial hospitalization in the Veterans' Administration. Have they done anything in the field of cancer?

Dr. FARBER. Yes, indeed. They are working in a number of veterans' hospitals, both on a research level and on a clinical level.

Some of these chemical compounds we are talking about are being used in veterans' hospitals throughout the country.

Mr. DOLLIVER. I somewhere have the impression that the Hines Hospital in Chicago was the center of the Veterans' Administration activities with respect to cancer.

Dr. FARBER. For that area, yes.

Mr. DOLLIVER. Thank you, Mr. Chairman.

The CHAIRMAN. Any other questions, gentlemen? If not, we will proceed.

Dr. HELLER. Mr. Chairman, in extension of the consideration of research we would like to call on Dr. Keith Cannan to discuss that portion of research to which you referred, which is the basic research, the advances which have been made, which, of course, make possible some of the advanced clinical research. Dr. Cannan.

STATEMENT OF DR. R. KEITH CANNAN, CHAIRMAN, DIVISION OF MEDICAL SCIENCES, NATIONAL RESEARCH COUNCIL

Dr. CANNAN. Mr. Chairman, members of the committee, and colleagues, I think much of my argument has already been anticipated in the discussion, but perhaps it might be helpful if I attempted to restate in a brief way what the cancer research problem looks like at the experimental and laboratory level; and I will speak very much as one watching the scene from the sidelines and not as an active participant in cancer research. Nor will I speak of any specific program of a particular agency, for the simple reason, I think, that when a scientist is engaged in research he does not think of his contribution to the program of a particular agency but thinks of it simply as a contribution to knowledge on a worldwide basis.

We might begin with the old dilemma of medicine: prevention or cure? Or perhaps, as it might be rephrased at the laboratory level: the search for causes or the search for cures?

Now, I would like to say at the outset that I hope in some degree I can persuade you today that although these two questions are posed as alternatives—they are phrased differently—it transpires that our approach to both of them seems to be down the same avenues of investigation, and it is rather arbitrary to draw the distinction between the search for causes and the search for cures.

To my mind it is as probable that the seeker for causes will stumble on the next good cure as it is that the seeker after cures may actually find a cause for cancer.

If we begin, then, with causes and restate our concept of cancer, we have considered it as a disorder of growth of cells. We can be more specific than that and say that it is a disorder that resides within the individual cell. This is not a disorder that is imposed from without; it is a disorder intrinsic to the malignant cell. Moreover, it is a disorder that is passed on, as we have heard. It is inherited by the daughter cells of the malignant cell. So it becomes self-multiplying as a disorder and therein, of course, lies its malignancy.

Now, what causes this disorder? We have heard today, and one may just repeat, that there are certain extrinsic causes of disorder, inciters to cancer, which impinge on the organism from without:

radiation, X-ray, radioactive materials, and even excessive exposure to sunlight. Then there are a group of heterogeneous chemicals, including a few metals, a number of hydrocarbons of curious chemical structure, a few tars and intermediates of the dye industry.

Now, this is a very mixed bunch from the point of view of the chemist, and there is no common thread of property in all these extrinsic inciters or carcinogenic agents, as we call them, which gives any clue as to why they should have this one unique biological activity of inciting the cell to malignant growth.

These agents have been immensely valuable in the laboratory, because they have allowed us to take the living cell in the laboratory and under control conditions to submit it to carcinogenic stimulus and then to study in detail not only the cancerous state developing, but to probe back into the region of the hypothetical precancerous state, the first disturbances that are a result of carcinogenic stimulants; but I will not dwell on the extrinsic causes of cancer because they are not a material contribution to the human cancer problem except, perhaps, as it may transpire in the field of lung cancer or in particular industrial hazards.

The majority, therefore, of causes, if there is more than one cause of human cancer, must be intrinsic to the organism itself. They must arise within the body, and they may arise possibly within the malignant cell or they may be inciters produced in one part of the body which actually create malignancy in other areas.

Here, if I may presume just for a minute to emphasize one thing which is perhaps more than obvious, though it can be forgotten, may I say that when we speak of cells, cells are not things. Cells are processes. They are not structures. We speak of living beings. They are not living beings. They are living becomings, and the whole process of growth must be conceived of as a constant flux, a constant process of change.

If one does that, then one must take the next step and acknowledge that the cancer cell is a chemical machine, a chemical engine, and that, therefore, this constant flux which is a characteristic of growth is a chemical flux, a constant turmoil of chemical change. Therefore, if cancer is a disordered cell there must be something different somewhere in the chemistry of the malignant cell as compared with the normal cell.

Now, I would like to lay down as the first direct inference, I think, in contemporary thinking in cancer, that the intrinsic cancer disorder must be a disorder somewhere in the change of events of chemistry within the malignant cell. Ten years ago or perhaps 15 years ago that might have had to be accepted as an axiom, without definitive proof; an act of faith. But it has been possible in the last 10 or 15 years to initiate intensive study of intimate chemistry of the living cell as distinct from overall balance sheets of the chemistry of the whole animal, and that has been made possible simply because the time had arrived in the history of the basic sciences at which methodology, instruments, isotopes, and a whole lot of methods adaptable at the micro level could be called into service to study the chain of events within the living cell.

So that the timing of the chemical approach to cancer has been determined by events outside of the cancer problem, by the progress

of basic science as a whole. And science became ready to make this attack.

The attack is only 10 or 15 years old at most, and we have far from explored the complete chemistry of the cell, but it becomes increasingly possible to believe that by persistent effort we can ultimately link up the whole chain of events in any particular sequence of processes in the life history of a cell.

Even so we have discovered already that there are significant differences in the chemistry of the malignant cell as compared with that of the normal cell from which it may have derived. None of these differences as yet seems to give any very definite hint as to what therefore was the chemical cause of the cancer, but they do establish and reaffirm the point that Dr. Rhoads and Dr. Farber have both made, that there is something chemically different about the cancer cell. With that faith one can move steadily ahead.

So we find from surveying, perhaps, and trying to summarize in 4 or 5 words the current thought about the cause or causes of cancer, the intrinsic ones, we assume that they must be chemical in their basic nature. They are chemical stimuli and they are chemical agents produced probably within the body, and there may be a multiplicity of them, or there may be 1 or 2 uniquely carcinogeic molecules which ultimately emerge in the life history of the organism, and the probability of whose activity seems to increase with the age of the animal.

In the second place, we are clear that this cause acts in some way, direct or indirect, on the hereditary mechanism of the genetic make-up, as we call it, of the living cell, so that it stamps a permanent and irreversible change ultimately on the cell, and the cell goes on to multiply its own criminal kind.

Again, we know that the susceptibility of different cells to a single inciter—and I go back to the extrinsic agents and by inference, of course, to a normal spontaneous cancer—can be modified by influences of the organism as a whole. Here the most clean-cut example is the influence of some of the hormones, notably the sex hormones, on the progress of an induced or spontaneous cancer.

So that one has then, to put it in the broadest terms, perhaps to conceive of some inciter material which triggers off the event by operating with or against that—maybe what we call the homeostatic mechanism of the body, the various defense mechanisms, stimulating and growth-restraining substances, these acting on the cell that has been the inciter of the target. They will determine in a large degree how rapid the progress of that cancer may be.

So you have two influences to consider: the inciter influence and the residuum of control that the body is still able to exert over the random and rampant growth of the disordered cell.

I believe, again from outside, that those of us who watch the cancer program in progress believe that in this one generation or less of intense study of the living cell considerable progress has been made, and one need only emphasize that there have been these unified contributions of biologists, microbiologists, chemists, physicists, pathologists, and the whole corps of investigators in the physical sciences.

But I believe that the most significant thing in basic science as it concerns cancer research at the present time is not that everybody is in it but that everybody who is in it is beginning to talk the same

language. One of the dilemmas of the physical science is always that each discipline talks its own language and we cannot understand what they observe because they cannot explain it in our terms. But progressively in physiology and in the whole problem of growth we are beginning to talk about the problem in terms of biochemical language and chemical language and the geneticist and the physiologist and the virologist and the rest of us can now talk to each other because we have a common language. That is the best assurance or guaranty, I believe, of rapid advance in the future.

I will not turn to cures in any detail, because Dr. Rhoads and Dr. Farber have displayed that side of the picture in detail.

I would like to say just one word about diagnosis, because that subject was raised this morning. You have heard that largely early diagnosis depends on the intuitive recognition of symptoms fortified by X-ray diagnosis and by pathologic examination, and that these are most likely to fail with those diffuse or deep-seated tumors which are asymptomatic, which are without symptoms in the early stages.

The physician undoubtedly needs a chemical test which will betray malignancy in its early stage. No such tests are available on any broad basis.

On the other hands, as it is true that not only is the chemistry of the malignant cell different from that of the normal cell, but that the malignant cell is able to modify significantly in many cases the blood and the urine of the patient carrying the tumor, then there is confidence that chemical tests will be developed. To my mind it is improbable that there will be any master test that will determine all types of malignancy. Rather we are likely to achieve a battery of tests, each specific for a particular type of cancer.

And I might add one further word, that it is more probable that those tests will be discovered as byproducts of basic studies of the chemistry of growth, than that they will be discovered by the man who goes out and says, "I will go out and find a test."

May I just in conclusion touch on the question of chemotherapy as it is seen from the laboratory level again. Tribute has been paid to the fact that the clinical student of chemotherapy depends in large measure on the basic sciences, and certainly he does. One would never think of any hit-or-miss approach to chemotherapy, in view of the fact that there are more than 1 million hypothetical, at least, organic compounds available, almost when the synthetic organic chemist presses a button.

Therefore, you must have some rational basis on which to make a narrow selection of compounds that are worth testing.

Again, if cancer cells differ chemically from normal cells, as we now have evidence they do, it is reasonable, as Dr. Rhoads pointed out, to assume that they have some chemical spots that are more sensitive than the corresponding spots in the normal cell process. Therefore, the target must surely be to find drugs whose chemical nature is such that they are likely to attack the sensitive spots in the malignant cell's metabolism. To do that you must, therefore, know all that you can possibly know about the chemistry of malignant growth.

So chemotherapy, equally with diagnosis and the causes of cancer, leans heavily on an intensive study of the intimate chemistry of the living cell.

Dr. Rhoads was confident that we should find a penicillin for cancer. I am not so confident that one miracle drug will arrive that will take care of all types of cancer, and I do not think he meant that.

Again, one may suspect we will gradually emerge with an increasing battery of chemotherapeutic agents, each of which will have particular value in the care and control of particular types of cancer.

So my broad summary from the point of view of basic science is that again it seems to me that progress in chemotherapy is likely to go step by step with the progress in the basic study of growth phenomena.

Thank you.

Dr. HELLER. Thank you.

The CHAIRMAN. Any questions, gentlemen? We certainly feel indebted to you, Dr. Cannan, for the splendid statement that you have made on this phase of the matter, to which you have devoted so much time and thought, and brought such great ability to bear.

I do not know whether it would be appropriate for me to ask a question, but can you tell approximately how many chemicals have been tabulated in connection with the search?

Dr. CANNAN. How many organic chemical compounds have been tabulated? Is that the question, sir?

The CHAIRMAN. Whatever way you want to express it. I am not familiar enough with it to know.

Dr. CANNAN. There are various tabulations. I have never seen the totals. The figure is variously estimated at three-quarter million compounds. I think that is the Beilstein figure. I am not sure. It is a compendium of organic compounds.

But that is not really a significant figure, because you can point to an organic compound and tell a chemist you would like something like that, and he will go back and make 10 new ones that differ very slightly from the one you pointed out. There is almost an unlimited number statistically of organic compounds.

The CHAIRMAN. All of which points out the difficulty of making the discovery that gives encouragement to the thought that there will be some one or more compounds that quickly will take care of this whole situation.

But what you have said with respect to the study that is being made, particularly when we have in mind that men of your type are engaged in it, certainly brings encouragement to the mind of a layman, when he realizes what is actually being done day in and day out. While each of us is engaged in his different activity, and thinks he is making some contribution that is worth while, at times we overlook the fact that at this very time you and your associates who are gathered here, and those who are associated with you, are working day in and day out on this problem. It is a very inspiring thought to me to realize the vast amount of thought that is going into the question of the health of our people in this Nation. We feel deeply grateful to men of your talent, who have come here today, and who have been willing to do so, to give us the benefit of your thought, your study, and your experience. We are hopeful that as a result of the inspiration that comes to us from your contribution here today, we on our part will be able to do something which will prove worth while and of help to all.

Dr. HELLER. Mr. Chairman, I would like to particularize some of

the thoughts which have been expressed by some of the previous panel members and ask Dr. G. B. Mider to indicate some of the advances in research being carried on at the National Cancer Institute, in order that this program may be rounded. Dr. Mider.

STATEMENT OF DR. G. BURROUGHS MIDER, ASSOCIATE DIRECTOR IN CHARGE OF RESEARCH AT THE NATIONAL CANCER INSTITUTE

Dr. MIDER. Mr. Chairman, may I enter a prepared statement of the work of the National Cancer Institute?

The CHAIRMAN. Without objection, it is so ordered.

(The statement referred to follows:)

CANCER

Prepared by the National Cancer Institute, National Institutes of Health, Public Health Service, United States Department of Health, Education, and Welfare

REPORT OF THE NATIONAL CANCER INSTITUTE ON THE CANCER PROBLEM

The control of cancer requires that the medical, social, and economic impact of neoplastic disease be minimized through preventive measures, effective treatment, or both. Alleviation of pain and the increase of an individual's useful years of life represent tangible and significant advances toward the goal of complete eradication.

All of these must be tied together to subjugate cancer: Knowledge, definition and broadening of areas of responsibility; stimulation and support of cooperative enterprises among clinical, laboratory, preventive medicine, social and other interested disciplines; employment of investigative techniques which are increasingly directed or applied; and the initiation and supervision of specfic field studies and investigation.

First, much more must be known of the causes, diagnosis, treatment, and prevention of malignant neoplasm. From the standpoint both of research and disease control, cancer may be considered as a group of diseases rather than as a single entity. Each of these diseases has as a common denominator the loss of the ability of the cells to achieve a normal life cycle. Starting from this general base, hundreds of highly skilled workers are devoting their life's work and millions of dollars are being expended annually toward a solution. The following discussion merely highlights some of the present difficulties that will most certainly require the contributions of additional hundreds of scientists and the expenditure of many millions of dollars.

MAGNITUDE OF THE CANCER PROBLEM

Most people have lost a close friend, a relative or even a member of the immediate family from cancer. This becomes understandable when the annual toll from this disease is considered on a nationwide basis. Cancer is the second leading cause of death, ranking next to cardiovascular diseases in this respect. It is now the stated cause of approximately 1 out of every 7 deaths in the United States, with more than 200,000 deaths occurring from cancer each year—the preliminary figure for 1952 was 224,130.[1] The importance of cancer as a cause of death is not confined to certain age periods but extends across the entire life span. Between 5 to 14 and 35 to 74 years it is the second leading cause and only at ages under 5 and over 85 years does it drop below third place when the causes of death are ranked in importance.

Because of the lack of information from other sources, mortality data have been relied upon in the past to describe the scope of the cancer problem. Important as they are, death statistics by themselves cannot define the problem adequately. As treatment becomes increasingly more effective, the curable types of cancer appear less frequently in mortality records. Furthermore, the medical certification of death states only the immediate and contributory causes of death

[1] National Office of Vital Statistics, Monthly Vital Statistics Report, vol. 1, No. 13, July 21, 1953.

and the number of persons dying with cancer is inevitably understated. This can occur because the certifying physician may not know or does not deem it necessary to indicate that cancer was present, or because death was obviously due to some cause unconnected with the presence of a cancer.

The approach adopted by the National Cancer Institute to secure data on the extent of illness from cancer is to canvass all the diagnostic sources within a community—hospitals, clinics, laboratories, practicing physicians—and to secure lists of all persons coming to diagnosis or currently under treatment, so that an unduplicated count of persons ill with the disease may be prepared. Ten urban areas were surveyed in 1937–39 and resurveyed in 1947 and 1948.[3] To insure more complete coverage, data on cancer deaths were obtained at the same time from city and State offices of vital statistics. The mortality records provided information on a substantial number of cancer cases not reported by other sources.

In the 10 cities surveyed in 1947 and 1948, the results indicated that cancer was being diagnosed at an annual rate of 319 new cases per 100,000 population and that 430 of every 100,000 persons were under treatment for the disease sometime during the year. Since the age distribution of these city populations is somewhat younger than for the country as a whole, rates for specific age categories were computed and applied to the United States population at each age for the purpose of making national estimates. Based on the findings of the 10-city morbidity surveys, the incidence (new cases per 100,000 population) for the United States (1950) was estimated to be 328 and the prevalence rate (cases under treatment during the year per 100,000 population) 441.

The age distribution of the population changes with time. If prevailing death rates at each age continue, in 1975 some 1,008,000 persons will be under treatment for cancer and 326,000 will die.

Unless the cancer death rate for older people can be drastically cut, the number of persons affected by cancer will increase by more than 50 percent during the next 25 years because a larger proportion of the population is living into the upper age brackets.

Age distribution of diagnosed cancer cases

The emphasis on the increased risk of developing cancer at the older ages should not conceal the fact that a very substantial number of cases are diagnosed among children and young adults. In the recent morbidity surveys 15.6 percent of all cancer cases diagnosed during the study year were persons under 45 years.

Probability of developing cancer

Sobering as they are, annual rates for incidence, prevalence, or mortality do not adequately describe the total cancer problem. Cancer investigators have to consider the risk of the disease developing over intervals as long as 10 or 20 years. Unless there is a reduction in the proportion of people who get cancer, of 100 people born during 1950, 32 will develop cancer at some time during their lives; cancer would develop in 3 before age 45, in 14 before age 65, and in 23 before age 75.

If cancer illness rates are not cut, approximately 50 million people now alive are going to have cancer and 25 million will die of it.

The lifetime probabilities for developing cancer of specific sites vary greatly From birth to age 65, 1 in every 12 women will have cancer of the genital organs or breast. For both sexes up to age 65, 1 in 22 will have cancer of the digestive system; 1 in 55, skin cancer; 1 in 83, cancer of the respiratory system; and 1 in 14, cancer of the urinary organs; 1 man in 142 will develop cancer of the prostate. The high incidence rate after age 65 for cancer of the digestive system makes it outrank cancer of the female genital organs and breast in overall lifetime probability.

Under current conditions, 16 of every 100 persons born can be expected to die from cancer; 1 person can be expected to die by age 45, 6 at age 65, and 11 at 75; 1 person in 7 now age 45 or older will die of cancer.

Hospitalization

Some 711,000 cancer patients will receive medical care in the United States during 1953. Data collected by the National Cancer Institute indicate that 62.1 percent of this total, or 441,530 cancer patients, can be expected to occupy hospital beds for an average of 27 days; 1 out of every 14 general hospital beds is occupied by a cancer patient. This proportion has increased

[3] Atlanta, Birmingham, Dallas, Denver, Detroit, Chicago, New Orleans, Philadelphia, Pittsburgh, San Francisco.

steadily since 1900 and accounts, in part, for the increasing need for hospitals despite the fact that over 102,000 beds have been added since 1946 as the result of the Hill-Burton program.

Available evidence indicates that cancer patients are receiving better medical care than they did 10 or 15 years ago. The proportion of cancer cases receiving medical care in a hospital (or a hospital clinic) may be taken as a rough index of quality of medical supervision. Of all cancer cases reported in the 1937 series of surveys by the National Cancer Institute, about a third (32 percent) did not receive medical care in hospitals. Even in 1947, more than a quarter (27 percent) did not receive hospital medical care.

Microscopic examination of tissue for verification of clinical diagnoses of cancer is accepted as necessary to insure accurate diagnosis and its frequency serves as another index of quality of medical care. Even in 1947, almost a quarter of the cases (23 percent) were not microscopically confirmed.

Economic loss

During 1953 about 530,000 new cases of cancer will be diagnosed. Probably three-fourths of the potential economic production of these cancer victims will be lost to society. Taking the age distribution of new cases of cancer into account, and counting as lost only those years that an individual may be considered as productive, the discovery of 530,000 cancer cases represents a loss of 3.5 million man-years of work.

Current estimates fix the average annual contribution per member of the labor force (age 18–65) to the gross national product at $3,500. Thus, the cases of cancer diagnosed in just 1 year (1953) will cost society $12 billion in lost goods and services. This includes the cost of medical care and the value of the potential economic productivity of persons caring for cancer patients.

Disruption of families

Mortality statistics and loss of man-years due to illness from cancer do not show specifically the impact of this disease on the basic unit of our society—the family. Illness of any kind may be financially upsetting to an ordinarily self-sustaining family. A terminal illness involving long-term, expensive treatment is usually overwhelming. When the cancer patient has been the breadwinner, cancer is a total family catastrophe.

It is difficult, if not impossible, to assess the effects of the loss of status or self-respect when a family is forced to accept relief which they had never previously needed. How can one measure the long-term effects on children whose mother must assume a wage-earning role because of the father's illness? Conversely, what yardstick can be applied to the difficulties which must be faced by a father of small children when their mother is ill with cancer? One-third of all cases of cancer in women occur between the ages of 35 and 55, when women are most likely to have teen-age children. Nearly one-fourth of all cases of cancer in men occur at these ages.

These effects of cancer have been inadequately studied. Little quantitative information is available. Economic difficulties are most likely to bring family problems to the attention of social agencies. In dealing with this compelling factor caseworkers have uncovered the more personal attitudes and reactions—fears, anxieties, reactions of guilt, and so on—which are frequently even more crippling to the family as a whole than the added fiscal burdens. This area of research will be of ever-increasing importance so long as the incidence of cancer continues to rise and definitive cure or prevention of the disease remain a problem.

So far this discussion has centered around the cancer patient already in or approaching the terminal stages of the disease. The other side of the picture concerns the cancer patient who has been made well enough to work. Quantitative data on this aspect of cancer illness are scanty, and what is known is dismal. Most industries refuse to employ individuals who have had cancer because of the increased risk of compensable illness. New opportunities for creative or productive employment are difficult to find for many cancer patients, particularly males.

Thus, there is nearly a total socioeconomic loss to the community in the case of male cancer patients, and a substantial one with female patients, even when they have survived their initial course of treatment for the disease. This difference between posttreatment experience of males and females is consistent with the more general statistical fact that while the rate of onset of new cases of cancer is practically equal for males and for females, the mortality rate

from cancer in males is now higher than in females. The reasons for this latter fact are not clear and systematic exploration in this field is indicated.

Most people know what happens to a person with advanced cancer. The medical, social, and economic effects of the late stages of cancer tend to perpetuate delays in diagnosis. Dread of pain and of physical or economic dependency has been found to be an important factor influencing people to delay in seeking medical advice when cancer should be suspected. This results in an ever-widening circle of loss to the community and to the Nation.

FUNDS ADMINISTERED THROUGH THE NATIONAL CANCER INSTITUTE

The National Cancer Institute was established in 1937 and received as its first appropriation $400,000 for fiscal year 1938. For the next 8 years appropriations remained at approximately the same level. After World War II when the necessity for diversion of funds to military needs had lessened and the Institute research program had become more firmly established, the increasing nationwide concern over the cancer problem resulted in an appropriation of $1,772,000 for fiscal year 1947. This relatively large increase over former years was to provide not only for expansion of the Institute's own program of research but also to provide additional support in the form of grants to cancer scientists in no governmental laboratories.

The beginning of the present scope of operations was, however, in 1948, when $14,500,000 was appropriated primarily to broaden and increase the granting program including for the first time grants for the construction of additional nongovernmental research facilities. Funds for construction were provided each year thereafter until 1953. The total appropriations for the National Cancer Institute for the intervening years were $14 million for 1949; $18,900,000 for 1950; $20,686,000 for 1951, and $19,500,000 for 1952. The provision of additional facilities increased the demand for support of cancer research and as the construction program began to taper off, funds available for other types of grants were increased. In 1953, therefore, although no funds were provided for construction grants $17,887,000 was appropriated.

The appropriation for the present fiscal year is $20,237,000 of which slightly more than 70 percent is appropriated for grants, almost 25 percent for research at the National Cancer Institute, and approximately 5 percent for auxiliary programs.

Of the $14,324,000 available for extramural activities, i. e., grant programs, $8,469,000 or approximately 60 percent is budgeted for project grants to scientists engaged in cancer research. In addition, $750,000 is budgeted for research fellowships, a program established to provide experience and training opportunities in research for promising young scientists. The remainder of the funds budgeted for extramural activities are devoted to cancer-teaching grants to medical and dental schools ($2,355,000); cancer-control grants to States ($2,250,000); and to training grants ($500,000), the latter utilized to provide special cancer training and experience to practicing physicians. The remainder of the National Cancer Institute appropriation, $5,913,000, is budgeted for operations carried out directly by the Institute. Five million thirty-one thousand and two hundred dollars of these direct operations funds are budgeted for the support of the laboratory and clinical research carried on at the National Institutes of Health, and $329,000 or approximately 1.6 percent of the total budget is for administration. Also, $393,000 is available for a technical and professional service engaged in interpreting the results of cancer research and in finding the direct practical application of these results to the cancer problem in order to benefit the general public.

The proportions budgeted for the various activities of the National Cancer Institute vary somewhat from year to year. The proportions set forth above, for the present fiscal year, however, are considered typical. From this it can be seen that combining extramural and intramural research activities 70 percent of appropriated funds are devoted to cancer research and approximately 29 percent to closely related activities serving to assist research and to capitalize on research results.

RESEARCH FOR FINDING IMPROVED METHODS FOR CONTROL OF CANCER

Most improvements in the care of the cancer patient will result from research. Many scientific specialties have contributed significantly to progress in cancer research and will continue to do so. Such a broad attack may seem diffuse to those not acquainted with the field, but experience has shown that

advances in the study of diseased states must in large measure await the availability of information obtained from investigations that seem to have little or no direct application to everyday problems. The point is often made, and can be substantiated from history, that practical applications of scientific facts and principles, such as inventions, are inevitable consequences of progress in amassing accurate information. It is for these reasons that research in several disciplines of science must form an integral part of cancer research. Many of these studies do not appear to be as spectacular as some of those made on cancer present in the patient, but it is important to keep in mind that if the supply of fundamental information is not constantly replenished, practical, tangible results for the patient will be all the more slow in coming. Many of the results which the cancer research worker considers highly significant never receive emphasis in the reading material presented to the public. A truly great amount of progress has been made in the last decade in this area of research. We have a much more thorough understanding of the nature, initiation, diagnosis, cure, palliation, and prevention of cancer than ever before.

Before discussing some of the most significant recent advances in these areas of cancer research, a significant accomplishment in general biochemistry of great importance to the cancer problem will be briefly mentioned as an example taken from an orthodox discipline of science. The availability of isotopes has provided a unique tool for biological and medical research. By using the isotope as a label in particular compounds it has become possible to follow what happens to various portions of ingested materials (food, drugs, oxygen, water, etc.) as well as breakdown products (including waste materials) derived from the tissues. This can now be done without radically altering the functioning of the living organism. Only a small amount of the isotope is necessary and the organism cannot distinguish between a compound containing an isotopic label and one not containing such a label. These studies, impossible before isotopes became available, have brought about a whole new concept of the living organism. Formerly, the structures of the adult body were considered to be static. Now, from these investigations with isotopes, it is known that actually the individual chemical components that make up the tissues are in a continual state of flux. This dynamic viewpoint of normal tissues has, naturally, led to a new viewpoint of cancer. Indeed, a number of cancer investigations employing isotopes have revealed certain important differences between cancer and normal tissue. Recently the isotope technique has been extended to allow a measurement of the rates of fundamental tissue processes in the intact experimental subject. This extension offers a new approach in the attack on cancer and other diseases since it is possible to measure in living tissue in a dynamic way differences which cannot be detected by the older ordinary analytical methods. Such fundamental studies both in normal and in cancer-bearing subjects must continue to form an integral part of cancer research, for cancer is, after all, a part of the phenomena that make organisms live.

Studies on the initiation of cancer

A summary of an extremely large amount of long and laborious work, indicating several significant advances, can be given by a listing of certain basic principles relating to the causation of cancer which have been affirmed and reaffirmed in each of several species studied, including man:

1. A wide variety of apparently unrelated agents—chemical compounds produced synthetically, naturally occurring compounds, radiations, and biologic entities—can elicit cancer.

2. Most of the potent agents will evoke cancer in only a fraction of the population studied.

3. The cancers that follow application of a powerful cancer-producing agent develop after a long period of apparent well-being which may be measured in weeks or months in laboratory animals but is probably a matter of years in man.

4. The advent of cancer need not be preceded by any constant, predictable, structural change in the tissue that is destined to become cancerous, at least by the methods of detection now available. In some specific cases, however, such changes can be detected.

5. Quantitative relationships between the character and intensity of some stimuli capable of producing cancer on the one hand, and the responses of laboratory animals on the other, have been defined.

Experience in studying those persons whose cancers arise as the result of accidental occupational or industrial exposure to carcinogenic hazards substantiates the validity of these generalizations. Additional confirmation is

afforded from investigating those peculiarities of locale or habit which predispose geographic or ethnic groups toward cancer.

On the basis of several studies indictment of a number of compounds present in the environment as agents that cause or contribute to the initiation of cancer in man has been made. Such compounds are tar, some petroleum products, radioactive materials, certain metallic materials, e. g., chromates, obtained in metal-smelting processes, certain aniline dye intermediates and other products or byproducts of industrial activity and modern civilization. From such findings it has been possible to prevent exposure to these materials by the industrial worker handling these agents; it is clear that numerous cancers have, therefore, been avoided, and such preventive methods will continue to pay inestimable dividends in terms of human suffering, loss of life, and dollars.

Current studies continue the search for such agents in the adulterants or condiments added to food, in materials used as herbal or synthetic medicines, in plastics and other widely used synthetic chemical materials, in the byproducts of industry discharged into the air we breathe (smog) and in the numerous chemicals to which workers may be exposed during manufacture or handling.

In addition to the above-mentioned compounds numerous other cancer-producing chemical agents have been prepared synthetically. Such synthesis programs are valuable in three ways: (1) They provide convenient tools to aid the laboratory investigator in the production, in a controlled and quantitative fashion, of cancer tissue; (2) although no common factor has yet been found among the diverse types of cancer-producing agents, to account for the cancerigenic activity, the possibility still exists that some subtle common factor can be discovered (perhaps giving clues to what is affected in the living cell which brings about the transformation to cancer); and (3) many of the agents synthesized are unusual compounds not known to occur naturally or to be found in industry, but our knowledge of natural products and the industrial use of new synthetic chemicals is expanding so rapidly that what was an esoteric compound yesterday may become an important and common industrial material tomorrow.

Also important in the production of cancer are the different forms of radiation: X-rays, the high-speed particles produced by radioactive materials and the modern apparatus employed in atomic energy research, and ultraviolet light. A great amount of work done in this field has enabled better understanding of the relationships between radiation exposure time and exposure levels and the production of cancer by radiation. From such studies it has become evident what precautions must be taken by the patient receiving radiation, either for diagnosis or treatment, the doctor, those in certain laboratories, industrial plants, mining operations, military operations, etc. Subsequent investigations must be directed toward giving us greater understanding of how radiation produces tumors and must tell us what are the long-term effects of lower dosages of radiation.

Some cancer-producing agents (e. g., X-rays and a chemical 3,4-benzpyrene) induce a variety of tumor types in a number of different animal species; others (e. g., the agent causing the disease in poultry, fowl leukosis, and the agent demonstrated in the milk of mice that affects the incidence of breast cancer in the offspring) induce cancer ordinarily in a single species. Many of these agents also produce different effects in the two sexes and in different strains of the same animal species. These findings indicate the importance of the constitution of the species concerned and emphasize the heritable factors that influence the reaction to an agent which produces cancer. That is to say, in addition to the many agents discussed above which can lead to the production of cancer (extrinsic factors), there are numerous factors in the laboratory animal and in man which can affect both the initiation of cancer and the course of development of the established cancer (intrinsic factors).

Controlled experiments have shown that susceptibility and resistance to cancer are to some degree heritable. But susceptibility and resistance are relative terms, and an overwhelming stimulus may overcome natural resistance. Conversely, an inherent or constitutional predisposition to cancer may find an adequate inciting stimulus in a quantity of noxious agents that would not elicit cancer in others of the same species. The importance of the heredity influence in production of experimental cancer has been demonstrated by developing many generations of inbred strains of animals. This inbreeding provides an invaluable tool for cancer research, especially in the investigation of the relationship between cancer and heredity, but the translation of the results obtained in this type of experimentation into clinical terms is extremely difficult since human heredity is the result of the opposite of inbreeding. Nevertheless, even in studies in

humans the effects of heredity can be detected. It becomes imperative, therefore, that the investigations which are attempting to define hereditary influences in terms of physiologic or biochemical functions be continued and correlated with the probability of developing cancer and other diseased states. This is a gargantuan task, but a start has been made in this direction.

The hormonal secretions of the body constitute another important group of intrinsic factors about which much has been learned. Quantitative studies of the effects of some of the hormones on the initiation of cancer have given a fair picture of the operating factors present, and a beginning has been made in attempts to understand the interrelaionships of different hormones acting together. Much remains to be done in this area, but the work has already provided information leading to hormonal treatment, so valuable in certain types of cancer, such as prostatic cancer.

For many years it has been known that cell-free (filtered) extracts of certain tumors could produce a few specific types of cancer when injected into the same species of animal from which the tumor tissues was taken. Such extracts are believed to contain viruses (the same kind of agent that produces certain infectious diseases, such as infantile paralysis, chicken leukosis, smallpox, influenza, the common cold, etc.). Some cancer-research workers believe that all cancers are caused by viruses that lurk in the body tissues in an inactive form and are activated by the extrinsic factors discussed above. Most cancer investigators believe only a few cancers are caused by viruses. Recently, some experiments have been reported which indicate that leukemia can be produced in mice by injection of cell-free filtrates into the young mice. If these observations can be corroborated, their implications are exceedingly important for new research, especially in that important type of cancer, leukemia.

The nature of cancer and its relation to the host

In most respects cancer may be considered to be not a single disease, but several. A varied picture occurs in the clinical nature of the disease in the patient and in the body site attacked. In addition, the behavior of cancer tissue varies widely in these important respects: (1) Progressive growth of the tumor; (2) transplantability; (3) nature deviation in structure from the normal; (4) invasiveness into the surrounding tissue; (5) the setting up of distant, new sites of growth (metastases); (6) the production of a wasting away in the host (cachexia); (7) occurrence of a superimposed infection; (8) production of hemorrhage in the area of the tumor. Tumors also vary in their deviation from the normal as regards function. It has been shown that some tumors retain their function so well that in tissues which produce a physiologically active secretion the added mass and consequently greater amount of secretion may cause striking changes in the functioning of the body. Other tumors lose completely some of the functions present in the normal tissue from which the tumor arose.

A measurable function in a given tumor may be lost completely while the structural characteristics are changed but slightly. Conversely, a function may be retained even though the structural picture shows great deviation from the normal. These phenomena are probably a reflection of our crudeness of technique. A number of studies in progress are directed toward increasing our understanding of the relationships between structures and function. Much additional work is in order, and it is to be expected that as these relationships become better known improvements in therapy and diagnosis will result. There is great need for diagnostic tests more sensitive than those based only on the picture of tissues as viewed through the microscope.

The bulk of our knowledge about the chemical mechanisms taking place in cancer tissues has been obtained within the past decade. By means of an extensive study of the chemical properties of tumor tissue it has been shown that in many respects tumors tend to resemble one another more than normal tissues tend to resemble each other. The extremes of function in tumor tissue fall well within the extremes found in normal tissues. In certain chemical functions cancer tissue has been shown to be deficient—e. g., the ability to oxidize certain chemical raw materials. In other functions cancer tissue exhibits remarkable activity—e. g., the ability to manufacture protein as the tumor mass grows. The last 10 years have seen remarkable advances in the study of the complex structure of protein and its formation in the living organism and in cancer tissue. Such investigations involve key problems in cancer research, and these studies must continue to be vigorously pursued.

Certain important relations between a tumor and its host have been established. It was long suspected that tumor tissue elaborates some material which has an effect on the body. For example, as a tumor grows to a certain size the activity of a chemical component of the liver (an organic catalyst or enzyme, called catalase) is reduced. When the tumor is removed the activity increases. A material has been obtained from tumor tissue which, when injected, can also produce a like change in the liver. Studies are underway, both on the nature of the material obtained from tumor tissue and on the mechanisms underlying the reduction of the activity in the liver.

Another important area of investigation is the problem of nitrogen metabolism in the tumor-bearing subject. Nitrogen is an essential constituent of tissues, especially in protein. It has been shown that nitrogen moves into the tumor tissue at the expense of nitrogen in the body tissues, even though large amounts of nitrogen are given to the patient as a well-balanced diet. Much additional work needs to be done to follow up some of these important leads. Such experiments are necessary if we are to learn more about the striking wasting away (cachexia) so impressive to all who have seen the advanced cancer patient. Such experiments must be extended if we are to obtain rational leads to be followed in the search for a means of treating this dread disease.

Treatment and palliation of cancer

Since no real cure is as yet available for all cancers physicians have defined the results of their treatment in the practical and understandable terms of years free from clinical evidence of the disease. In general, the majority of recurrences of cancer before the patient dies from some other cause come during the first five posttreatment years. It has become customary, therefore, to speak of "5-year cures" and to make comparisons of one form of treatment with another form on the basis of results expressed in terms of 5-year cures. Any evaluation of a form of treatment in the patient therefore takes several years to carry out, and it must be remembered that patience must be exercised in awaiting results of a new form of therapy.

Surgery and radiation have been and still are the only effective techniques available for curative therapy. They are curative only when the tumor cells have remained localized to areas from which they can all be removed by surgery or destroyed by radiation. For disseminated cancer, with cancer cells spread no one knows how widely, surgery and radiation with other adjuncts of good medical care can still be of considerable palliative value in prolonging life with reasonable comfort afforded. There is no sound basis for the attitude that there is nothing more that can be done. This is the attitude which leads patients and their families to squander their substance and hope in the vain patronage of quack remedies.

Both surgery and radiation have become more effective in recent years for cancer therapy because other scientific and medical advances have permitted them to be used more extensively and adequately. Infections, hemorrhage, shock, anemia, and other blood deficiencies, faulty nutrition and metabolic disorders were a few of the secondary problems that limited the amount of surgery or radiation that could be used in cancer treatment and the length of survival of the patient after treatment. A number of accomplishments in several fields of investigation have allowed greatly improved management of these problems before, during, and after treatment and the surgeon and roentgenologist are now able successfully to extend both his curative and his palliative surgery to tumors that were previously "inoperable." The operative mortality rate has gone down, the 5-year surgical-cure rate for some types of cancer is improving, and many patients with disseminated cancer are living much more comfortable lives up to the time of their inevitable deaths.

Two important techniques in radiation therapy have been introduced to mitigate against some of those factors that limit the administration of an adequate tumor dose. Both are attempts to apply greater radiation to the tumor without injuring the surrounding normal tissue. One technique involves a carefully calculated placement of the patient in such a position that he may be rotated during exposure to the radiation beam so that the tumor is at the center of rotation in line with the radiation beam. Thus, a maximum amount of radiation is given to the tumor and a minimum amount delivered to the skin and intervening tissues in any one area. Evaluation of this method in comparison with other methods of treatment is in progress, but it is too early as yet to be able to say if this procedure offers any improvement over other methods or if the more complicated and somewhat more expensive equipment can be justified.

The second technique relatively recently introduced into radiation therapy is the employment of very high or supervoltage radiation. With a high-voltage therapy (up to a million electron volts) there is less scatter of radiation into the surrounding normal tissues and greater depths of penetration of an effective radiation dose than can be obtained with lower voltages. Investigations are currently in progress to evaluate supervoltage radiation therapy (produced by instruments capable of delivering up to 70 million electron volts and with differing qualities of radiation). At least 10 years more of good clinical evaluation studies must be made before the true value of the giant radiation instruments as compared to other methods can be ascertained.

Radiation is no panacea. Many cancers regress under the bombardment, but others are radiation resistant and grow unchecked. Some may even be stimulated to more vigorous growth.

In some cases this weapon saves many and prolongs the lives of others, but it has sharp limitations and does not in itself provide an answer to the cancer problem.

Experiments designed to increase our understanding of the biological effects of radiation are in progress in laboratory animals. In addition to the importance for cancer research, such studies are, of course, needed because of the development of atomic-energy weapons. Especially important to both areas are studies on radiation sickness (nausea, vomiting, diarrhea, fatigue, and weakness, plus, in severe cases, anemia, hemorrhage, and superimposed infection resulting from large doses of radiation). It has recently been found that shielding of the spleen or bone marrow or the prompt administration of nonirradiated spleen or bone-marrow material to an individual exposed to a normally fatal dose of radiation can prevent or counteract many of the usual consequences of such exposure. These findings give new leads to possible effective means of protection against large amounts of radiation. Much remains to be learned in this area.

Along with the prevention of cancer one of the main goals of cancer research is the discovery of a drug—i. e., a chemotherapeutic method—which will destroy the tumor tissue without injuring the other tissues in the cancer patient. If such a discovery were available, it would be the ideal therapy, for not only could localized cancer be treated without the mutilating effects of surgery and radiation but disseminated cancer could also be effectively treated. A single such drug for all cancers presupposes that tumor cells contain a component common to all types of cancer cells which distinguishes them from normal cells. No such component has been demonstrated as yet, and, although many do not believe such a component exists, certain similarities (e. g., biochemical) suggest, at least, the possibility of such a common factor. At any rate, since no demonstration has as yet been brought forward, the research worker in chemotherapy is seeking agents which will (1) modify the systemic toxicity produced by cancer; (2) alter the relationship between the systemic environment of the cancer cell and the cell itself; (3) interfere with the blood supply of the tumor; (4) stimulate defenses of tissues adjacent to tumors against invasion; and (5) differentially damage functional and metabolic processes in normal and cancer cells.

A wide variety of observations in a number of basic disciplines, e. g., organic chemistry, pharmacology, experimental pathology, biochemistry, physiology, etc., have provided the leads which have been the basis of testing well over 10,000 compounds against animal tumors. The laboratory worker, as well as the clinician, is faced with the problem of selecting agents which will inhibit or destroy tumor cells but which will not exert simultaneously unacceptably high toxic effects against normal cells and organs. Evidence that a compound meets one or another of the criteria of effectiveness in any screening program precipitates a chain reaction of chemical syntheses in attempts to make series of similar and related compounds, some of which will show an increase in anticancer activity, or a decrease in toxicity for the host, or both. Much additional work needs to be done to improve the criteria for anticancer activity. We need to know much more about the basic mechanisms operating in the living organism if we are to shift our approach from what has been mostly empirical to one more rational. Furthermore, while a number of valuable leads for treatment in the patient have come from the studies in animals, a number of examples are known which show that a compound may be rather potently active in the experimental animal and yet show no activity when tested in the cancer patient.

In spite of difficulties such as those mentioned above a number of compounds have been made available which, in certain types of tumors, have given benefit for the cancer patient. The sex hormones, both estrogens and androgens, have met with a limited degree of acceptance in the management of breast and pros-

tatic cancer. Cortisone and ACTH appear to be of benefit in modifying the course of certain leukemias and related cancer (lymphomas). Urethan has enjoyed a measure of success in certain leukemias and myelomas. Nitrogen mustard has been of benefit in treating some of the leukemias and lymphomas, particularly Hodgkin's disease. The folic acid antagonists, in the hands of some clinicians, appear to have been of distinct value in the management of acute leukemia. Currently the purines and pyrimidines and their related compounds have shown promise in the treatment of leukemia.

On the basis of the numerous factors given above, a number of cancer investigators believe the time is now ripe for an expansion of a chemotherapy program for cancer, especially leukemia, particularly in terms of increasing numbers of compounds synthesized and of an enlarged program of testing for anticancer activity in the patient. Many believe a coordinated program of research can be insttiuted in this area of investigation, achieved by deliberate participation of selected scientists experienced in the intricacies of scientific exploration in a limited area who pool their specialized knowledge and skill for the common good. Various therapeutic programs in malaria, syphilis and antibiotics have succeeded from this type of program. Success requires that sufficient progress shall have already been made in the birth of ideas when the study is undertaken to form a frame of reference or a point of departure for future work, for if such ideas are not available, all the meetings for the purpose of coordinating the research, all the activity as team research, will be of little value. It is always more difficult to discover the elements of a subject than to develop the subject. Once a sufficient number of basic ideas have accumulated, however, cooperative techniques can be employed to bring about full development of the subject.

APPLICATIONS OF CANCER KNOWLEDGE

Progress in the control of cancer depends not only upon continued laboratory and epidemiological research, but also upon application of the products of research as rapidly as practicable to the problem of discovering and treating individual cases. Responsibility for promoting such application through the development of case-finding techniques and programs of professional and law education rests upon both Government and voluntary groups.

The key to succesful medical management of cancer is finding and treating the disease early. Therefore, the watchwords, particularly for the medical profession but also for the lay public, are "early suspicion, accurate diagnosis, and effective treatment." The two general objectives are: First, to find ways to shorten the dangerous time intervals between the onset of the disease and diagnosis, and between diagnosis and the start of treatment; and second, to improve the level of cancer diagnosis and management.

Developments in therapy of cancer by surgery, irradiation, and chemical compounds have been reviewed earlier in this statement. The possibilities of prevention through knowledge of the nature of cancern-causing agent and influences have also been discussed. An extremely important area, however, is that of specialized and general public education for better cancer control, and the provision of facilities by means of which the most advanced techniques for discovering and treating cancer can be used to best advantage.

As with any disease, case finding is extremely important in the control of cancer. Because of the importance of early diagnosis to successful management of cancer, every effort must be made to find individual cases in the earliest stage, if possible even before ordinary symptoms appear. This gives added importance to frequent medical examinations with reliance upon all available aids to diagnosis.

Advances which have been made in the diagnosis of cancer of specific sites have made it necessary to abandon many basic concepts in order to make possible the detection of early cancer. For example, it is recognized today that abnormal vaginal bleeding as a direct result of uterine cancer means, in the majority of case that a gross lesion with possible ulceration is present, and that this is not an early cancer in the present sense of the term. By examining cells from the vaginal tract, a microscopic lesion of the uterine cervix, referred to as "carcinoma-in-situ," can be detected. Some authorities believe that all cervical cancers begin in this symptomless manner and after a time grow and become a truly invasive cancer. If this can be substantiated it will mean that this lesion is cervical cancer at its early stage and is curable in practically 100 percent of cases.

In breast cancer it has long been felt that if a mass in the breast were small in size it probably had not spread to other parts of the body, particularly the nodes in the armpit, and was "early" cancer. It is now recognized that the size of the primary mass does not necessarily bear a direct relationship to the stage of development of the cancerous process and that the stage of truly "early" breast cancer lies further back, in its development, toward a microscopic lesion.

In lung cancer it is now recognized that cough, chest pain, expectoration, and loss of weight are manifestations of a late cancer. An early lung cancer produces no symptoms and reveals itself as a silent shadow on the X-ray film or through cancer cells in bronchial secretions which can be examined under the microscope.

Case finding

There is now no one screening procedure or test which will discover early cancer of all types. There are, however, tests for cancer of specific sites which are valuable case-finding tools. Other techniques and procedures are being developed and applied in this area.

It would be highly desirable to determine the kinds and types of people most apt to develop cancer. If this could be done case-finding efforts could be more specifically directed toward groups in which cancer of particular sites is most likely to occur. There are, in fact, geographic, climatic, racial, socio-economic and environmental differences in the occurrence of cancer, whose significance to case finding has been appreciated only recently. There are, for example, racial differences in the incidence of cancer of specific locations. The incidence of cancer of the uterine cervix, to take one specific finding, is higher in Caucasians than in Negroes, while the reverse is true of cancer of the body of the uterus.

Facts of this type are not only guides to case finding, but suggest theories as to cancer causation which must be explored extensively.

Much has been written concerning the so-called cancer age—the idea that cancer occurs rarely among people under 40. Sizable numbers of cancer patients are under 35 years of age. In fact, among children 5 to 19, cancer is the third leading cause of death.

Recent studies suggest that heredity may play an important part in the predisposition to some types of human cancer. Certain family groups appear to have a higher concentration of breast and gastric cancer. In cancer of other sites hereditary susceptibility has not been demonstrated, and it may be that heredity has little or no influence in some types.

The habits of people may have a relationship to cancer. For example, excessive cigarette smoking appears to have a relationship to the development of lung cancer, although the evidence is still inconclusive on this point. Numerous studies are being conducted to determine if such an actual relationship is primarily causative. Exposure of workers to a number of materials in their environment may be the basis for development of the majority of occupational cancers.

Case-finding programs have taken principles, devices, and procedures utilized by other disease-control programs and attempted to adapt them to the cancer problem. For example, the small X-ray film used in photofluorographic screening of the population for tuberculosis has a degree of usefulness in the discovery of early lung cancer.

Cancer clinics

A cancer clinic is a facility, usually located in a general hospital, and organized so that representatives of the various specialities, including surgery, pathology, radiology and internal medicine, can work with the patient's private physician on diagnosis and treatment.

The number of cancer clinics throughout the Nation has increased markedly in recent years, but there are still far fewer than are required to meet the need. The establishment of additional clinics is being promoted and encouraged.

Diagnostic tests

A variety of general diagnostic tests for cancer have been developed, most of which have been extensively evaluated but none of which is sufficiently sensitive or specific for clinical use. However, the fact that some of them work to some extent is an indication that something tangible occurs in the body of a cancer patient which may be susceptible to measurement in a diagnostic procedure. Further intensive work is needed in this area and may result in a reasonably satisfactory general diagnostic test for cancer.

Such a test, if available, would be of considerable value in determining those individuals who would require further diagnostic study. Although it would be a considerable step forward in cancer control, a general diagnostic test would not eliminate the necessity for carrying on further diagnostic procedures to determine the organ or area of the body involved by the cancerous process.

Lacking a general diagnostic test, there are certain techniques by which cancer of specific sites can be indicated in an early stage when opportunity for control is greatest. One of these is the cell-examination technique—called exfoliative cytology—developed by Papanicolaou and Traut, which has proved its effectiveness as a diagnostic aid in cancer of the uterus, bladder, and stomach. This technique is based on the facts that: (1) Cancer cells do not adhere closely and consequently are shed readily; (2) these cells have characteristics by which they can be identified microscopically as cancer cells. The test is applicable to a number of body secretions or excretions, such as vaginal fluid, sputum, gastric washings, and urine.

It has been demonstrated that this technique can indicate the probable existence of uterine cancer, particularly where the cervix is involved, even in the absence of significant signs or symptoms and without suggestive gross findings. The technique has proved its effectiveness as a diagnostic aid also in cancer of the lung, bladder, and stomach.

Professional education

In recent years considerable effort has been devoted to the improvement of cancer teaching to undergraduate students in medical and dental, and, to a lesser degree, in nursing schools. These efforts have assured that graduates of these professional schools have a better understanding of cancer and are better equipped to handle the disease problem.

These educational efforts have been extended beyond the undergraduate years to graduate physicians who are qualified and interested in obtaining special training in the diagnosis and treatment of cancer. Both voluntary and governmental groups support such specialized training for physicians. The need for this training is increasing.

In addition, the level of competence of practicing physicians, public health workers, nurses, and other professional groups concerned with the control of cancer has been increased through educational media such as refresher courses, national conferences, teaching films, manuals or guidebooks, and professional bulletins.

Lay education

As the physician's index of suspicion of cancer is raised, it is also necessary to show the lay public the importance of cooperating with the medical profession for more effective cancer control. A well-planned, widespread, and continuous public educational program can reduce deaths from many types of cancer. It can do so by stimulating the individual's awareness of cancer and by teaching him to seek medical attention at the earliest moment in the development of his disease.

Carefully designed educational materials and devices have been produced and widely distributed by both voluntary and Government groups. Some of these have been most effective in showing people precisely what signs they should suspect as indicative of cancer.

In general, the public is better informed about cancer today than at any time in history. But the task of educating the entire adult population on a subject until recently taboo, in a way which will be accepted and understood, is complex and stupendous. With progress in research and therapy, the educational problem will increase. There will be more to tell, and the dividends from early detection will be higher.

CONCLUSION

Certain information has been furnished in this document concerning the problem of cancer, the resources with which to combat the challenge, and the current status of research and control. It is quite possible that more successful treatment than now exists may precede thorough understanding of the problems of normal and abnormal growth. To accomplish this, better diagnostic tests are imperatively required, so that early treatment can be applied and thereby achieve the best results.

It is impossible, of course, in a short summary report, to set forth satisfactorily an exposition which is definitive of the problem and at the same time sufficiently interpretative of the investigations in cancer being undertaken

throughout the country. Medical research is not static or predictable, but progress is being reported steadily as the facts assert themselves at the bedside or at the laboratory bench. The advances in cancer control have been made through continuity of effort and maintenance of progress in all aspects of the problems. Much more needs to be accomplished to effect total control of cancer, and there is much to encourage us that substantial gains toward that end can be expected in the near as well as the distant future.

Dr. MIDER. Dr. Heller, Mr. Chairman, gentlemen of the committee, and colleagues, I find it rather difficult to particularize on the excellent presentations that have preceded mine.

The National Cancer Institute historically has taken the attitude that it is one of the groups working in cancer research, that it is doing its best to contribute to the total effort, and that it has earned a position of leadership by virtue of the correctness of the work it has done and its prompt dissemination to all those interested in the field of cancer.

Until very recently the facilities available to the staff had been limited to those appropriate to the study of cancer in laboratory animals. A large amount of the work falls in the area of basic research, but there has been a considerable effort directed toward the study of certain aspects of cancer in man.

It is well known that cancer is not equally distributed throughout the world, as part of the testimony this morning indicated. Neither is it equally distributed throughout the United States. And a part of the Cancer Institute's effort has been to attempt to define those groups in various areas and occupations or which for some other peculiar reason have a particularly high or a particularly low risk to specific anatomical types of cancer. Information of this type has been most helpful in guiding work in the laboratory on the causation of cancer and the principles that have been learned at the National Cancer Institute and at the Memorial Center and many other areas are summarized in full on page 12 of the document submitted by the National Cancer Institute this morning.

So that we have arrived at certain general principles relating to the extrinsic and intrinsic factors which together apparently are responsible for the causation of cancer. By establishment of these general principles, together with further study of life groups of the populace, we hope that we may hasten the practical prevention of cancer in man.

Now, we have heard that cancer is a variety of diseases, and all of us agree to that; yet it has been standard procedure today to speak of cancer as one disease, and there is much merit in this, because various biochemical studies conducted at various institutions have shown that there is commonality in some of the chemical characteristics of malignant neoplasm. It has been shown that the enzymes, those proteins responsible for most of the functions of the cell, are more closely alike in this wide variety of cancer than in the normal tissue from which the cancer cells necessarily arise.

The chemical dissection of the cell that Dr. Cannan alluded to has proceeded rapidly at the National Cancer Institute and it would appear today that we need to discover and define even smaller quantities of biologically active substances than seems possible at this time.

The leukemia studies that Dr. Farber has spoken of have profited considerably by the comparable studies on leukemia in experimental animals; its induction and its treatment by various types of ionizing rays and by chemotherapeutic agents. It is a source of much pride that probably the first effort directed toward the development of a

drug by any group in cancer research was pioneered by Dr. Murray Shear of our staff.

We hope to improve the efficacy of treatment with various types of X-rays and other types of ionizing radiations which are now becoming available. One factor that has limited the usefulness of X-rays is the undesirable side reaction which makes the patient ill. Dr. Jacobson at the University of Chicago was able to prevent some of these symptoms by a comparatively simple method of shielding the spleen; and more recently Dr. Lorenz of our staff has been able to prevent death from X-rays by the transfusion of very tiny amounts of bone marrow. It would appear that there may be some chemical substance provided by the bone marrow which may influence the person's reaction.

The intramural program of the National Cancer Institute has been in operation for almost 14 years. The record is a proud one, much too involved for me to give to you in detail, but if you wish I would be glad to prepare such a document to be inserted in the record at a future date.

It is becoming ever more clear we probably are not going to learn all the information that we need to control cancer efficiently and effectively from the study of cancer alone.

Dr. HELLER. Thank you, Dr. Mider.

Mr. Chairman, have you any questions of Dr. Mider?

The CHAIRMAN. Any questions, gentlemen?

Mr. CHARLES TOBEY, JR. Mr. Chairman, my name is Charles Tobey, Jr.——

The CHAIRMAN. Now, Mr. Tobey, for what purpose are you asking recognition?

Mr. TOBEY. Because I possess information, sir.

The CHAIRMAN. I am not asking that. Is it for the purpose of making a statement, or asking a question; or for what purpose is it?

Mr. TOBEY. It is for the purpose of giving the committee information it should have before the day is over.

The CHAIRMAN. Very well. If you will see the chairman when the committee has adjourned I would be glad to talk to you, as I have previously talked to you, and I will be glad to have any information you wish to give.

Dr. HELLER. Mr. Chairman, we have had a discussion of research, both basic and clinical. We have had some examples of advances that have been made. We have had an illustration of the translation of the laboratory findings to the patient.

I should like to complete the cycle of approach by requesting one or two of the panel members to give us some information which would enable the committee to understand the methodology and have information as to the plans and the attacks in what we call control; that is, translating to the private physician, translating to the patient, as it were, in a general sense, those things which are found at the bedside as well as at the laboratory bench.

I should like to call upon Dr. Ralph Meader, who is Chief of the Research Grants Branch, to give us briefly the way in which research grants are administered, and something of that mechanism, in order that the committee may have that transitional step by which the method of training research workers and of taking to the worker at

the bench in the universities and others throughout the country the sort of support which the Congress recognized in its wisdom that we must have in order to carry on cancer research, is accomplished.

With your permission, sir, I should like to call upon Dr. Ralph Meader to give us a brief explanation of that.

The CHAIRMAN. We would be pleased to hear Dr. Meader.

May I inquire, Dr. Heller, how many more witnesses you have? My only purpose in asking is realizing that the hour is becoming late and we have a desire to finish, so that no one will have to come back tomorrow.

Tomorrow, as you may know, I assume it will be a most interesting hearing, because representatives of the Atomic Energy Commission are supposed to be present to give us some information as to the studies they have been conducting. We have heard many statements made. I do not think anything has been said publicly as yet, so that much that will be said tomorrow will be of the first instance, so far as public information is concerned; and I am looking forward to that with a great deal of anticipation.

For that reason, and also the fact that I assume these witnesses are anxious to get back to their activities, I am trying to finish this this afternoon.

Dr. HELLER. Mr. Chairman, we have two more short presentations.

The CHAIRMAN. I do not mean to cut you short. I want you to go ahead. This committee is willing to continue long enough to get the story before us as you folks wish to place it.

Dr. HELLER. Thank you, sir. Dr. Meader.

STATEMENT OF DR. RALPH G. MEADER, CHIEF, RESEARCH GRANTS BRANCH, NATIONAL CANCER INSTITUTE

Dr. MEADER. Mr. Chairman, Dr. Heller, and colleagues, and this committee, in the brief time that remains for me to present this material I shall try to hit only the highlights and to present to you some of the information on the manner in which the will of Congress or the will of the American people or philanthropic donors of funds for cancer research is able to be transmitted and carried into the activities of the individual research worker.

This fundamental problem is common to all organizations which have the problem of dispensing funds for support of cancer research and cancer control. There are many different sources from which these come, and there are many different places to which the funds could be distributed. Of course, the major problem is, Where can they be most effectively laid or placed; and, On what basis or what criteria are they distributed?

I think it is perhaps the simplest thing to say that it is on the basis of the best advice available to the Representatives of the Congress, the Surgeon General of the Public Health Service, or on the basis of the best advice given to the American Cancer Society or the various private organizations that the awards for cancer research are made, with the aid of individual scientists of the same type and caliber as those who have here addressed you and told you of the problems which are basic to the cancer process.

I might illustrate it first and perhaps most easily by telling you that a person who has an idea for research on the problem of cancer

has a number of opportunities to seek and obtain support. He can turn to the National Cancer Institute and make application for funds there. He can turn to the Committee on Growth of the National Research Council to apply for funds, which may come through the American Cancer Society. He may turn to the Damon Runyon fund for similar support; or other private organizations, like the Jane Coffin Childs organization, the Pardee Foundation, or the Anna Fuller fund. Any of such organizations will receive his application and give it careful thought. They will seek the advice of the persons who seem best qualified to advise the donor as to the allocation of funds.

In the case of the Public Health Service there was created by law—I think in the law which was reviewed by this committee and recommended to the Congress—a National Advisory Council to the Surgeon General. We have a National Advisory Cancer Council which was created by law and which is composed of 15 persons. The individuals who review the applications on the Council also have the assistance of large panels of individual scientists whose recommendations, combined with the knowledge of the members of the Advisory Council, are transmitted to the Surgeon General; and on the basis of that the Surgeon General makes awards.

I shall not attempt to go into details as to how other agencies operate, but it is very similar. As you heard this morning, the committee on growth of the National Research Council makes similar recommendations to the American Cancer Society, and it does so on the basis of recommendations of individual scientists scattered all over the country, who come together to advise the committee on growth and the American Cancer Society.

Now the research programs of the various agencies are very similar in their character, because the basic problems of cancer research fall into general areas.

As you have heard before from Dr. Cannan, there are other causes for the inciting of cancer through extrinsic or intrinsic factors. There is the problem of the nature of the tumor or the cancer and the characteristic by which it grows and multiplies; there is the problem of diagnosis, and the hope that, through biochemical means, we will find means of early diagnosis. And then there is the problem of therapy.

Rather than attempting to cover the whole field, I might point out that with the approximately $5 million which the Congress appropriated for the National Cancer Institute to dispense in research grants for cancer, there have been supported approximately 500 research projects. If you are interested in some sort of figures, you might guess that there is at least 1, and probably an average of 3 professional persons, associated with each of these research grants.

So that for just those projects which are supported with tax funds through the National Cancer Institute, there are probably in the neighborhood of 1,500 professional scientists of different degrees of development who are working on these problems.

Now, those individuals have had to get training, and one of the greatest needs in our whole research field is probably the development of new ideas in the approach to the cancer problem; new ways to explore the old problem, and consequently the fellowship program is a very important part of our training for future research.

The National Cancer Institute has been able, with the approximately $625,000 provided for fellowships, to train about 162 fellows in the field of cancer research and the allied fields that are basic to it.

As Dr. Cannan pointed out, each year the American Cancer Society has a simliar fellowship program, a similar research grant program—and I wish there was time; there should be time—for you to have and I think you will have in the record from each of the various organizations, such as the Damon Runyon fund and other societies, a statement describing the research grants, the peoples supported by them, and the people who are being trained by them.

I think in order to save time, I should call a halt here.

The CHAIRMAN. I am very anxious to have all the information that is available from any of these organizations.

It has been my intention to call upon Mr. Teeter before this session ended today, to give information for the record concerning the Damon Runyon Foundation to which you have just referred.

As to the others, I hope you will all feel the utmost freedom in making available to me whatever information you wish placed in the record to supplement what you have testified to here today, because I realize there has been a pressure of time that has probably prevented each of you from saying all that you wanted to say—certainly prevented you from saying all you could have said.

For that reason, I want to keep the record in such shape that we will have the benefit of whatever you think ought to be in there on this subject.

Dr. HELLER. Mr. Chairman, in further extension of this control discussion which we had, control used in the narrower sense of the word—the translation of what we know and what we learn and get to the public, I should like Dr. Cameron to indicate the concepts of control and some of the applications which are observed not only in the American Cancer Society but in control generally.

Dr. CAMERON. I think this committee must be fundamentally interested in knowing whether the method of cancer control is an effective one.

I propose in less than 5 minutes to give you some of the early theories of this 40-year program of cancer control, which, as you have heard, is based on education of the public, increased alertness of doctors and the provision of adequate facilities for detection, diagnosis and treatment.

You will first notice that in charts 11, 12, and 13 there have been three different studies of the factor of delay. There has been a constant decline during the period of measurement in the interval between the onset of cancer symptoms and the time the patient consults his doctor. If this is of value in the control of cancer, it should be reflected in increasing survivorship rates, and those I am going to run through quickly.

Dr. Rhoads has alluded to their study—the Vermont study. In the year of 1937 of all patients with cancer admitted to Vermont hospitals, only 20 percent had localized disease and were considered candidates for cures and treatment. In their study covering a period of 10 years, the proportion of patients with cancer admitted to State hospitals with localized disease had risen to 58 percent. Of all patients with breast cancer seen at the Mayo Clinic between the years 1910 and 1919, 63 percent already had extensions of the disease from

the breast to the glands in the armpits, with relatively unfavorable setting for cure.

Of the patients sent to the clinic during the year 1945, only 45 percent had cancer of the breast in that unfavorable state.

This improved outlook, of course, is reflected in the survivorship rates both at the Mayo Clinic and in our own hospital. Of the number of patients suffering with breast cancer which could be operated upon in 1936, 47.5 percent were living 5 years later, but of the group seen in 1942, there were 60 percent living 5 years later without any significant change in the treatment technique and Dublin has shown among the female policyholders of the Metropolitan Life Insurance Co. a very substantial drop. There has been 11 percent decline in the death rate of cancer during a 10-year period, and in the age group from 55 to 64, when cancer is most common, there has been a 15-percent decline in the death rate.

The State with a respectable registry of cancer—a statewide cancer registry—is Connecticut and I will cite the figures from there briefly. Of the patients with cancer—and they know of 95 percent of all patients with cancer in the State so far as it is possible to determine—of all patients with cancer who were registered in the Connecticut Tumor Registry as having had cancer in the year 1935, there were 18 percent living 5 years later of the males, and of the cancer-registered patients in 1941, there were 25 percent living 5 years later. Among females in the State of Connecticut, 25 percent were alive 5 years after they were registered in 1935. But, of the group registered 6 years later—in 1941—there were 40 percent living at the end of 5 years for males and females.

This improvement, from 22 percent at the end of 5 years for the 1935 registered group, to 33.5 percent survivorship 5 years later based on the 1941 group, is significant.

If you will look at the table of the trends in cancer between the years 1933 and 1946, which are before you, you will see that cancer of the pancreas, of the prostate, of the intestinal tract, of the ovary, and of the larnyx is increasing, but at rates which are of doubtful statistical significance.

There is no question whatever about the significance of the increase in cancer of the lung, but cancer of the skin, of the kidney, of the bladder, stomach, rectum, breast, uterus, the esophagus, tongue and lip, are either not increasing or are decreasing. These are figures covering a 13-year study period. I think these are heartening records and I think they indicate that the mechanism for cancer control may well exist.

Dr. HELLER. Thank you, Dr. Cameron.

The CHAIRMAN. Are there any questions?

Mr. CARRIGG. May I inquire if that same kind of survey as conducted by the New England States has been carried out on a nationwide basis?

Dr. CAMERON. No, it has not.

Mr. CARRIGG. Those are merely technical spot checks?

Dr. CAMERON. Yes, sir.

The CHAIRMAN. Is that information which you have just given in any of these documents that have been previously handed to me?

Dr. CAMERON. Yes, sir; it is, sir.

The CHAIRMAN. Are there any further questions, gentlemen?

Dr. HELLER. Mr. Chairman, I should like to call upon Dr. Wermer of the American Medical Association to complete any remarks or information he may have for us apropos of the Research Foundation of the American Medical Association, or their relationship to the control activities.

Dr. WERMER. Mr. Chairman and members of the committee, the American Medical Association, since it is an association representing most of the physicians practicing in the United States, would be most interested in the treatment measures that could be applied by most physicians without any special skills in the treatment of cancer.

As you realize after hearing the description of method or treatment outlined by Dr. Farber and Dr. Rhoads, rather skillful people must administer some of the treatments outlined.

In 1946 there was reported a form of treatment of cancer of the breast which had spread beyond the breast and had become inoperable and not available to treatment by any one form but use of sex hormones—male sex hormones. That report initially in the United States came from Dr. Rhoads' institution, and shortly thereafter Dr. Nathanson, of Boston, who is present, made a report on the use of estrogen—that is the female sex hormone—in the treatment of cancer.

The subcommittee on steroid and hormones of the Committee on Research was then formed and both these men—Dr. Adair of the memorial group and Dr. Nathanson took part as investigators. You will find an outline of that experimental program on page 3 of the formal statement which I presented to the committee, and to save time I believe that would be the best information.

I think at this time, with your permission, I would like to introduce the other problem that we feel so strongly about.

You have heard today outlined the efforts of the many, many disciplines that are necessary to give us a basic understanding of the cancer problem, and I think that all of us here appreciate the enormity of this problem. It is unfortunate that all the problems in regard to cancer are not on the positive side—that is imposed by the disease itself. There are some venal negative portions of this problem which are manmade, and are created by those who seek commercial dividends by foisting false hope of cure on the cancer patient, and his family.

For over 50 years the American Medical Association has shown bold leadership in opposing these forces. During this time we have maintained an agency for the collection and dissemination of information on nostrums and quackery. We feel this task to be a public duty in order to protect the laity and to furnish physicians with objective evidence as to the lack of value and the identity of the secret nostrums proposed as cures.

In this endeavor, the association, through its bureau of investigation, has cooperated closely with the various Federal and State agencies charged with the enforcement of laws regulating the drug industry. The Food and Drug Administration is one of those agencies. The Federal Trade Commission is another. We have also cooperated with the State agencies which have jurisdiction over the licensing of individuals who seek to follow either the practice of medicine or the other healing arts. This has not been an easy task, gentlemen, in turning the searchlight of truth upon the quack; we have frequently become the defendant in a court of law. Thus, the association has

been obligated to spend large sums of money in the defense of such legal actions. It is significant, however, to note that although we have been sued for more than $40 million over the years, we have been obliged to pay but 1 judgment and that, in the nominal sum of 1 penny.

This is a constant battle in which we have chosen to remain in the forefront. Even now several nostrums are being promoted to the public either on representation that cures are obtainable or that the proponents are experimenting clinically for something new and valuable in the management of cancer patients, particularly those beyond the conventional methods of treatment used by medicine.

In our efforts to educate and evaluate—I notice there was an error here in our statement—that next word should be "evaluate"—We have been joined by the American Cancer Society, the National Cancer Institute, the Damon Runyon Foundation, and the Food and Drug Administration in sponsoring the National Research Council's Committee on Cancer Diagnosis and Therapy. Inasmuch as I hope the work of this committee will be described by one other witness, I will not go into details on it, but we believe that it gives the Nation a sound method of evaluating proposed cancer cures and diagnostic aids. It is the intention of our association to encourage and further every honest attempt to increase our knowledge about cancer, to continue our earnest efforts in the quick dissemination of such knowledge to our physician members and to foster the type of cooperative research program previously outlined.

This concludes my formal statement.

Dr. HELLER. Mr. Chairman, our final panelist has the information which follows very closely Dr. Wermer's presentation. So, with your permission, at this time I will ask him to proceed, and then the committee may have questions.

We have a very distinguished physician from Boston—Harvard University—Dr. Ira T. Nathanson, who is the chairman of the committee to which Dr. Wermer and Dr. Cameron referred earlier, namely, the Committee on Diagnosis and Therapy of the National Research Council.

The CHAIRMAN. We are very pleased to have the doctor testify. I assume he will give the committee some information as to the makeup of the Council.

Dr. HELLER. Yes; he will.

STATEMENT OF DR. IRA T. NATHANSON, CHAIRMAN, COMMITTEE ON CANCER DIAGNOSIS AND THERAPY, NATIONAL RESEARCH COUNCIL

Dr. NATHANSON. Mr. Chairman and members of the committee and others. You have heard very briefly some of the reasons for the institution of this type of care, which is unique in many ways in medical annals. Many of the agencies that sponsored the committee and other organizations have received various proposals for control of cancer either on the basis which was described this morning where temporary relief may be obtained, or on a permanent cure basis.

I would like to reemphasize that there are still two methods or orthodoxy in cancer therapy—the methods of surgery and radiation, as you know and have heard from the testimony, and the method of

treatment with hormones which was being described a short while ago, which now appears may give us a good attack on the disease when it spreads beyond its localized areas. In other words, in those patients who are no longer amenable to our standard treatments which are in general the only methods of cure.

The agencies to which these proposals were made or to which inquiries were made regarding the so-called method for control, were not set up to answer nor did they have the information to give the individuals who might request this information. Also there is the situation that these independent agencies might feel that they were not justified in talking for anyone else, and as I understand this—having come into this picture somewhat later—about 2 years was spent by a very good committee who devoted a lot of time as to the wisdom of this type of committee. Could it accomplish what it was set up to do? It was then decided that this committee should be set up and this was done under the auspices of the National Research Council.

The committee was established in November 1950, and the first meeting of the committee was on February 1, 1951. There were few suggestions and proposals as to what the committee might be expected to do by the sponsoring agencies, which I shall name: The American Association for Cancer Research, the American Cancer Society, the Damon Runyon Memorial Fund, the National Cancer Institute, and the Food and Drug Administration. They all lend their sponsorship and assist in every possible way. I think I neglected to mention the American Medical Association.

The committee has complete leeway to approach this problem on a completely unbiased basis, so that we do not owe anything to anybody. We are a group of individuals who are independent in their own rights, who have no obligation to any of these sources, although we ourselves avail ourselves of the opportunities to receive money for research in our own areas for control of cancer.

The committee membership is composed of a variety of individuals with different disciplines, some with a specific point of view and others who have the ability to understand the problem from a broad horizon.

I would like to cite here for the record the Principles and Procedures for Evaluation of Proposals and the Tentative Criteria for Cancer Diagnosis and Therapy.

The CHAIRMAN. We will be happy to have these materials for the record.

(The material referred to follows:)

PRINCIPLES AND PROCEDURES FOR EVALUATION OF PROPOSALS, JULY 1953

Committee on cancer diagnosis and therapy, division of medical sciences, National Research Council, Washington, D. C.

The committee on cancer diagnosis and therapy was initiated by the National Research Council to evaluate proposals and claims for the diagnosis and therapy of cancer, in response to the request of seven national agencies to which such problems were usually referred. These agencies, having greatly diversified activities, recognized the need for the creation of an independent advisory body charged with the collection and evaluation of information in respect of such proposals and claims. The primary objective of the committee is to determine the efficacy of various proposals for the diagnosis and treatment of cancer, and to provide information, advice, and opinions to the organizations that sponsor and support its activities.

I. GENERAL PRINCIPLES AND DEFINITIONS

A. Principles

1. General principles are established. Policies and procedures are necessarily tentative, inasmuch as flexibility is essential to enable the committee to meet widely varying situations. Exceptions or changes can be made at any time by a majority vote of the committee.

2. Every procedure adopted should embody the action of the committee as a group, rather than action as individuals.

3. The primary function of the committee on cancer diagnosis and therapy is to evaluate the efficacy of proposals in this field and to render an opinion to the sponsoring agencies. There are three opinions that can be rendered:

(*a*) The proposal has merit.

(*b*) The proposal has no merit.

(*c*) There are not sufficient data to enable the committee to form an opinion in regard to the efficacy of the specific agent or procedure. Under such circumstances:

B. Objectives of the committee

1. To supply an opinion in answer to a request from a sponsoring agency.

2. To supply an opinion to the sponsors on matters deemed important by the committee or the chairman of the division of medical sciences.

3. To provide a central office for the collection of information concerning proposed diagnostic or therapeutic procedures for cancer, and to make a factual summary available, when requested by sponsors or the committee. The executive secretary makes this summary. In such a summary, it should be clearly stated that any ideas expressed therein are not those of the committee; that committee views are stated only in its final opinion.

4. Inquiries that do not come through the committee, the sponsors or the division may be referred to a sponsoring agency or to other sources of information.

C. Definitions

The following terms are employed in these procedures:

1. Proponent: A person who claims to have a new test or therapy for cancer.

2. Proposal: The test or therapy that is advocated by the proponent.

3. Exponents: The persons who have taken up the claims of the proponent and are using the procedure.

4. Sponsors: The sponsoring agencies.

5. Request: The formal request for advice or an opinion; this may be submitted by the sponsors, the chairman of the division of medical sciences, or members of the committee.

6. Investigator: A scientist or clinician who may assist the committee by conducting a laboratory or clinical study.

7. Consultant: A specialized individual with specific techniques or training whose advice or opinion is sought by the committee.

8. Observer: An individual who at the request of the committee may visit a proponent or exponent to secure information.

If there is urgency and need for further study, and if mutual agreements with proponents and investigators permit, more data will be accumulated.

If the need for a study has diminished, or if it is not possible to reach a mutually satisfactory agreement, a report will be drafted, as specified in IV. C. 2.

II. SELECTION OF INVESTIGATORS, CONSULTANTS, AND OBSERVERS

A. Panels of investigators

Lists are compiled upon:

1. Recommendations from sponsors.

2. Members of committees, panels, and study sections of the Division of Medical Sciences or of the sponsoring agencies.

3. Recommendations from members of the committee or from members of the panels.

4. Recommendations from other investigators who know the qualifications of individuals.

B. Selection of observers, consultants, and idnvestigators

Observers, consultants, and investigators are selected from the panels by the chairman of the committee in consultation with the executive secretary.

C. Arrangements with investigators

Consultants and investigators remain anonymous, unless the committee decides that exceptional circumstanses make another course advisable. All arrangements are made through the committee.

III. SPECIFICATIONS FOR ASSEMBLY OF INFORMATION

A. Information on therapeutic procedures to be requested from proponent

1. Therapeutic agent(s):
(*a*) Method of manufacture, preparation, and sterilization.
(*b*) Composition and chemical or other specifications.
(*c*) Stability and data on deterioration.
(*d*) Method of standardization, including controls and checks.
(*e*) Method of assay for potency.
(*f*) Other pertinent laboratory data.
(*g*) Animal toxicology and pharmacology.
(*h*) Human toxicology and pharmacology, including patient acceptability, the toxic reactions that may be encountered, and pertinent information concerning the relative frequency, intensity, and type of such reactions.
2. Clinical usage:
(*a*) Dosage, including method and frequency of administration.
(*b*) Criteria for selection and for clinical usage of the agent(s).
(*c*) Time after initiation of therapy that one may expect:
(1) Favorable subjective response and its nature.
(2) Favorable objective response and its extent.
(*d*) Length of time during which treatment should be continued before it may be assumed that favorable response is not probable.
(*e*) Advantages and disadvantages of the new agent as compared to those already in clinical use.
3. Therapeutic results:
(*a*) Number and type of patients for whom the agent(s) has been employed, including:
(1) Total number of patients treated.
(2) Total number of patients for whom the time was too brief for favorable response to be evident.
(3) Number of patients who have received treatment for the period of time considered necessary for evaluating efficacy of the specific therapy.
(4) Information on the type and extent of the last previous therapy given to each case, and the length of time that intervened between such treatment and initiation of the therapy under study.
(*b*) Clinical results obtained, including the number and types of cases that have shown favorable or unfavorable response. Details should be given concerning the objective or subjective nature of these responses, and also their consistency and duration.
(*c*) Other investigators who have employed this mode of therapy.
4. Published reports:
(*a*) List and reprints of proponent's publications concerned with this therapeutic agent(s).

B. Information on diagnostic procedures to be requested from proponent

1. Type of procedure.
2. Agents and reagents employed, with data on:
(*a*) Composition.
(*b*) Methods of preparation and standardization.
(*c*) Stability.
3. Explicit directions for carrying out the test.
4. Diagnostic results, including:
(*a*) Number and types of cases that were tested:
(1) Cancer—with basis for diagnosis, type of neoplasm, and stage of the disease.
(2) Controls—normal individuals and other diseases.
(*b*) Number of tests done under each of the above three categories, with results expressed in numbers and percentages.
5. Results obtained by other investigations using this test.
6. Published reports:

(*a*) List and reprints of proponent's publications concerned with this diagnostic procedure.

C. Survey

1. Proposal:
(*a*) Information on the proposal and the therapeutic or diagnostic agent(s), procedure, and results furnished by proponent, as detailed under III *A* and *B*.
(*b*) Information on the proposal obtained from the sponsors, other responsible organizations or individuals and from publications.
2. Financial data:
(*a*) Expense of the test or therapy.
(*b*) Support for the proposal.
3. Reports of previous investigations.
4. Proponent:
(*a*) Biographical information.
(*b*) Copies or abstracts of pertinent publications.
(*c*) Facilities of proponent's place of work.
5. Exponents:
(*a*) Biographical information.
(*b*) Results obtained by use of the procedure.
(*c*) Copies or abstracts of pertinent publications.
6. Organizations and institutions:
(*a*) Information on scientific, legal, and financial aspects as related to the proposal.
(*b*) Additional personnel concerned with the proposal.

D. Basic information for clinical investigators

1. Statement of policy of the committee.
2. Arrangements for the specific study.
3. Criteria formulated by the committee and approved by the proponent.
4. Scientific biography of proponent.
5. Brief historical background of the proposal.
6. Therapeutic agent—composition, manufacture, etc.
7. Safety factors—pharmacology, toxicology, sterility.
8. Clinical usage, including the criteria and directions given by the proponent.
9. Times and nature of response.
10. Therapeutic results reported by proponent and others.

IV. STIPULATIONS IN RELATION TO SPECIFIC TERMS

A. The request

1. The request must be officially presented:
(*a*) By the sponsors—in writing.
(*b*) By the committee members—in writing between meetings, or as a motion at the time of the meeting.
(*c*) By the Chairman of the Division of Medical Sciences.
2. Requests for opinions from the proponents or others than the sponsors, the Divisions or committee members must be referred to the sponsors for preliminary review.
3. All sponsors are notified simultaneously concerning the committee action on a request.

B. The proposal

1. The proposal must be of unestablished or controversial nature.
2. Information on the nature of the proposal must be available.
3. In order to avoid duplication of effort, except in unusual circumstances:
(*a*) The proposal must not be in the process of being tested or evaluated by any of the sponsors.
(*b*) After the committee has initiated a study, it is understood that the sponsors will not initiate an independent study of this proposal except with the consent or by the request of the committee.
(*c*) If another evaluation of the same proposal is in process at the time the request is received, or has been previously undertaken by independent qualified investigators, consideration should be given thereto and to the need and advisability of assisting a current investigation.
4. A preliminary estimation of the urgency and need for an evaluation of a proposal should be made by the sponsors and committee members. These views will guide the committee in the decision concerning acceptance of the request.

Both the preliminary estimation and the priority rate to be assigned an investigation should be based on such factors as:

(*a*) Acuteness of the problem nationally.

(*b*) Acuteness of local or regional problem.

(*c*) Scientific status of proponent and of proposal. The purpose of this procedure is to permit the committee to devote its major efforts to the more urgent proposals. At any stage in an investigation, at the discretion of the chairman, an expression of views may again be sought and a change in the priority rate be made.

C. Reports to sponsors

1. An interim progress report on an investigation may be requested by a sponsor at any time. When prepared, it will be sent to all sponsoring agencies. Further use of this report should be decided by the sponsors, preferably by mutual agreement.

2. If an inquiry has reached an impasse, due to inability of the proponent and the committee to reach an agreement, and further progress appears improbable, a report will be drafted. It will include information on the steps taken, the factual findings and whatever conclusions can be based on available data.

3. Reports will be circulated to the committee. The approval of the committee, the Chairman of the Division, and the legal adviser of the National Academy of Sciences, are required for a report to become official.

D. The opinion

1. The opinion of the committee is formulated by the members, either at a meeting or by mail.

2. A majority of the committee members must agree with the opinion. The minority may formulate a minority opinion, if desired.

3. If there is not agreement on formulation of an opinion, the inquiry will be reassessed for the purpose of determining what further steps, if any, should be taken.

V. PROCEDURES FOR EVALUATION OF PROPOSAL

A. Vote regarding acceptance of request

1. An opinion on a proposal may be requested from the committee whenever:

(*a*) Information on the nature of the proposal and the indications for a study are available.

(*b*) Views of sponsors and members concerning the urgency of the proposal are known.

(*c*) Inquiries have been made concerning other past or current evaluation studies.

2. Acceptance of request includes assignment of priority rating by the Committee.

3. The sponsors are notified concerning the committee's action on a request.

B. Steps to secure cooperation and information

1. Proponent is contacted.

(*a*) Letter requests cooperation.

(*b*) Statement of policy is included with letter.

(*c*) If reply is favorable, further steps are taken.

2. Proponent is requested to present his data, claims, criteria, and evidence as detailed in III *A* or *B*.

3. A survey is compiled as specified in III *C*.

4. Panel or a representative, appointed by the chairman and representing the committee, visits the proponent:

(*a*) To establish mutually acceptable basis for further study.

(*b*) To secure further information.

(*c*) To discuss criteria, provision of agents and a plan of study.

5. There is sent to the committee:

(*a*) The survey.

(*b*) The report of the visit by the panel.

(*c*) A sheet for expression of views regarding adequacy of data and for further comments.

6. If data are deemed deficient, requests may be made for:

(*a*) Additional evidence to be assembled by proponent.

(*b*) Advice or assistance of special observers or consultants for specific problems (i. e., chemist, pharmacologists, clinician for review of records, etc.).

7. If a separate program for laboratory or other investigations is indicated:
(*a*) Investigator is selected.
(*b*) Available basic information is given to investigator.
(*c*) Experiment as designed should be mutually agreeable to the investigator and the committee (and in selected instances to the proponent.)
(d) Financial arrangements for the study are made.

C. Formulation of study plan

1. Proponent and committee agree on criteria and study plan.
2. Investigators are selected, are given available basic information (as in III *D*) and are invited to make suggestions.
3. Plan of study, including criteria, must receive the mutual agreement of investigators, the proponent, and the committee.
4. Financial and other arrangements for effectuation of plan are made.
5. Records of supplies of agents, etc. are kept in committee office.
6. Reports from investigators are sent to committee office.

D. Evaluation of reports

1. Reports are reviewed and data compiled.
2. Records of the study are evaluated by the committee.

E. Formulation of report or opinion

1. Opinion, if it is deemed that data provide sufficient evidence.
2. Report, if an impasse has been reached and further progress of the inquiry appears improbable.
3. Plans for further action, if data are considered deficient and additional investigation is desired.
4. The report or opinion will be submitted to the legal counsel of the National Academy of Sciences for approval. If major changes are advised, it will be recirculated to the committee. All changes should receive the approval of the chairmen of the committee and of the division as well as legal counsel.

VI. TRANSMISSION OF REPORTS AND OPINIONS

A. To the sponsors

After full approval has been given, the opinion or report will be presented to the sponsors.

B. Notification of proponent

The proponent will be informed by the committee office when a report or opinion has been presented to the sponsors.

C. Responsibility for utilization of report or opinion

1. The sponsors (preferably the sponsor who made the request or has been most interested in the study) will assume the responsibility for presenting the report or opinion to the proponent.
2. The sponsors will assume the responsibility for securing further legal advice whenever necessary and will decide questions involving utilization and publication of the report or opinion.

TENTATIVE CRITERIA FOR CANCER DIAGNOSIS AND THERAPY

Committee on cancer diagnosis and therapy, division of medical sciences, National Research Council, Washington, D. C.

I. CRITERIA FOR DIAGNOSIS

A. Microscopic diagnosis

Microscopic diagnosis of a lesion is essential for the diagnosis of cancer. This microscopic material, including the slide on which the diagnosis was based, should be available for examination. A board of review, composed of competent pathologists, should be set up to study the microscopic slides of any particular case.

B. Presumptive criteria

X-ray studies, Papanicolaou smears, gross appearance of lesions, etc., are regarded as presumptive criteria. These are acceptable for the diagnosis of certain lesions which are consistent with the spread of a previously biopsied

tumor. Presumptive criteria are not acceptable when used alone in cases where a single cure for cancer is claimed, but may be permitted as a portion (up to 10 or 25 percent) of a series of cases. For a number of cases, autopsies will provide additional or confirmatory data.

C. Extent of the lesion

The diagnosis of a cancer should include not only the diagnosis of the disease, but information regarding the extent of the disease. Furthermore, once the type of diagnosis is established, the extent of the lesion or the severity of the process may be estimated by different criteria depending on the specific type of cancer. Staging of disease, such as the League of Nations stages for cancer of the cervix, should be employed whenever possible.

D. Ancillary studies

Ancillary studies may provide additional information. Thus, the bone-marrow picture in acute leukemia is of considerable diagnostic importance in indicating the extent and spread of the disease, whereas the acid phosphatase in prostatic cancer is useful in indicating the presence and activity of the disease but is of no value in determining the extent of the disease or prognosis.

II. CRITERIA FOR RESPONSE TO THERAPY

A. Criteria for measuring individual response to therapy

1. Subjective improvement.
2. Objective improvement.
3. Performance status—PS. (This criterion is not unanimously considered to be an essential one, since some members of the committee feel it might be included in subjective improvement.)
4. Duration of improvement.
5. Consistency of response to a specific form of treatment in a given clinical situation.
6. Cure, a complete absence of disease, is the most satisfactory and acceptable criterion.

B. Quantitative response

Anything less than complete freedom from disease is a quantitative improvement, and for this group details of objective and subjective response are important. Improvement in an isolated or individual case, without reference to any series of patients treated, is misleading and meaningless for the purpose of evaluating a method of therapy. Cancer is so variable in its course and spontaneous improvement has been noted before, so that any form of treatment might be able to present remarkable isolated instances of improvement. The value of an individual case is provocative in that it may lead an investigator to duplicate this result in similar types of patients.

C. Qualitative response

The important criteria of qualitative response to therapy are also dependent on the treatment of a number of patients.

D. Criteria for measuring group response to therapy

1. Percentage of apparent cure rate,[1] if it can be shown that there is no clinical, laboratory, necropsy, or other evidence of disease.
2. Five-year survival rate,[1] or any other arbitrary number of years which may be considered most appropriate for the particular type of disease.
3. The criteria of improvement in individual signs and symptoms and the consistency and duration of this improvement.

The measurement of these effects will vary almost entirely with the site and the type of cancer treated. A chart has been prepared which lists the major types of cancer and some of the objective and subjective manifestations of these diseases which may be suitable for clinical study in the evaluation of a therapeutic response.

III. CRITERIA ON TYPES OF TUMORS TO BE CONSIDERED

Certain tumors are of particular value in the therapeutic evaluation of a treatment because of specific effects on the body and the precise objective criteria which may indicate improvement. Such conditions are noted in chart I. Ex-

[1] If possible, these rates should be given on an absolute as well as a relative basis.

ternal or easily accessible tumors are not necessarily the most satisfactory for clinical study, since regression and changes in their histological appearance often furnish unreliable criteria. However, serial biopsies are easier to obtain and do provide some evidence. In general, each type of tumor is a separate entity and requires different criteria; therefore, the tumors to be studied and the criteria to be employed will vary according to the purpose of the study and the agent under investigation.

IV. CRITERIA IN RELATION TO OTHER FORMS OF THERAPY

A. Combination therapy

Studies involving a primarily curative procedure in combination with a questionably effective agent are usually unsatisfactory since long-term statistical studies on large numbers of patients are required to prove that the added procedure appreciably increases the cure rate. Similarly, combination therapy involving two variable and slightly effective agents is also extremely difficult to carry out. This does not imply that combination therapy studies are of no value, since very useful results may stem from such investigations; however, the pitfalls and dangers of premature conclusions must be kept in mind, unless remarkable synergistic effects are obtained.

B. Relation to previous therapy

Since many patients with cancer have had previous therapy, it is necessary that the patient's condition be carefully evaluated. The time interval before initiation of another form of treatment will vary—for instance, after X-ray an interval month, or every 6 months, would be desirable.

C. Relation to other factors

In essence, therefore, it is extremely difficult to prescribe a procedure for evaluating a proposed method of therapy. This depends on the nature of the proposed treatment, the type of effects that may be expected from its use and the type and natural course of the tumor treated. Similar variable factors apply to the evaluation of combined forms of therapy. The experience, clinical judgment, integrity and objectivity of the clinical investigator are far more important than the following of set, prescribed procedures which can never be precisely applicable to a given patient for a given type of study.

V. CONTROL DATA

A. Natural course of the disease

There already exists a large body of knowledge on the natural course of cancer, and the results obtained with inadequate forms of therapy, and this information will serve as a control series for the evaluation of most new agents. This is based on the fact that most forms of chemotherapy do not cure or produce prolonged remissions in cancer and any agent which will consistently alter the course of the disease would immediately be a conspicious improvement over the control data.

B. Alternate case control

In evaluating curative forms of therapy or in comparing the activity of one chemotherapeutic agent with another, it would be obviously desirable to have alternate control cases. In view of the marked variations in the natural course of cancer, however, we require a large series to draw any important conclusions unless a really outstanding difference exists between the two forms of therapy.

C. Time of onset

In determining the survival of a patient, it is suggested that the time when the definitive diagnosis is made be taken as the time of onset of the disease.

D. Reporting of results

In reporting the results of any experimental series, it is essential that all the patients presenting themselves for treatment be reported. This is necessary because one can obtain remarkable results by eliminating the patients who do not survive longer than a certain period after the onset of therapy or by selecting patients who appear to be favorable cases.

You have before you after 2 years of deliberations, because this is a new idea in many ways, a statement of policy which has evolved as a result of the deliberations of the committee over the period since

NATIONAL RESEARCH COUNCIL
DIVISION OF MEDICAL SCIENCES
COMMITTEE ON CANCER DIAGNOSIS AND THERAPY

CHART I

| | SUBJECTIVE | | | | | | OBJECTIVE | | | | | |

its inception in February 1951. This statement of policy is before you and I think that it is self-explanatory.

Briefly the committee is interested in any type of proposal which may show merit for the control of the disease, whether it be control on a permanent basis or whether it is temporary control.

You have heard from the various sources around the table that the sex hormones might significantly alter the course of an established cancer of breast origin or protastic origin. These agents are made in our own bodies. These are some of the agents which are being directed against cancer, and this, to us, is exceedingly exciting and points up to the fact that it has offered us a tool for the study of cancer. Also, we have the other techniques and mechanisms which involve the hormones of the adrenal, such as cortisone. These compounds have led us into a whole new area of research.

With that idea in mind this committee has been approaching these various proposals from the standpoint of effectiveness of the procedure. Are the proposals sound and legitimate on the basis of the evidence presented? Do we need more evidence to accept a proposal or should we dismiss it and pay no attention to it?

I can say for the committee, since I am speaking for them, that this committee has been one of the hardest working committees I know. Our heart and soul have been in it. They recognized full well that scientific merits are only part of the situation as to the sponsoring agency. We recognize our moral and social responsibility to this Nation and other nations.

I feel that what I have to say now is a summary of what we have done and are trying to do today.

I have before me a summary of what we have done and we can make it available to you if you so desire. This information is in much more detail.

The way we approach a problem is this: Proposals may be divided into two groups; one group comes through the usual channel of scientific publications such as the journals mentioned by Dr. Wermer today and such journals as sponsored by the American Cancer Society, the National Cancer Institute, and many other organizations. Full information on these is usually published and they will be evaluated by investigation. In other words, there is a desire to go ahead with this work. This is what I allude to when I talk about the hormone situation. There are just a few of us working in this and it was not until this was recognized and that it could be done, that other investigators begged to come into the study.

There are other proposals, however, which are not given to scientific journals and which may be advocated by either laymen or physicians. The information which is available is sometimes incomplete. There are many factors involved in the proposals. These proposals may have merit and they may not have merit. We do not know at the time they are made and it is our concept that we will evaluate as best we can for the sponsoring agency the possibilities of any proposal. During this last year from September 15, 1952, to September 15, 1953, the committee files have accepted information on 200 different forms of therapy proposed as classified above: One, scientific investigators and publications and other proposals which I just stated. Out of these, 75 came from scientific investigators and publications and 125 from other proposals.

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Requests or suggestions have been received for further investigation or evaluation of 62 of the different proposals in the latter group. You can see what this means to us to be suddenly thrown a number this great. So our committee has had to look at this from the standpoint of its possibilities, from the standpoint of its national impact and its possibilities from the standpoint of a real attack on cancer and from the standpoint of exciting a lot of people's curiosity and perhaps misgivings later on. We have had a very difficult problem in trying to sift out what really is the most important matter.

We have been fortunate in having as the executive secretary of this committee one of the most diligent and conscientious individuals I have ever known who is completely devoted to this thing. She has worked beyond what anyone could expect her to do in this work and she is Dr. Isabelle Wason, executive secretary of our committee.

The committee will accept proposals from three sources; they will accept proposals for study from the sponsoring agencies; they accept proposals from members of the medical division of the National Research Council or from the chairman of this division, Dr. Cameron, or from its own membership. Those are the ways in which the proposals are put before the committee. The committee then propounds questions about it in this fashion: These are the steps in the investigation of a procedure or proposal after request is received; the assembly of information comes from the proponents—those who propose the treatment—and others, by correspondence, personal conferences and review of literature, if such is available. There should be full information on the nature of the procedure, the composition and preparation of the products used, the method of clinical usage, with emphasis on the safety to patients, and the results that have been observed in the treatment of proven cancer.

Frequently, the product or method of preparation is secret and details of clincial usage may be withheld. In many instances there is no biopsy proof that the disease was actually a cancer or, if so, of what type.

The information having been assembled is then subject to review by the committee. A decision concerning further action is based on the completeness of the available information, other previous or current studies of this therapy, the scientific and clinical significance of the data presented, public welfare, with particular attention to the local or national status.

Procurement of further information on the nature of the agent requires a good deal of technical advice which requires the assistance of scientists with specialized training in different fields.

We then, if the proposal is accepted by the committee on the basis I have tried to indicate, try to make arrangements for clinical trials of this material. Efforts in this direction are being made with some preparations and we hope that in the near future we will have these under full study. And we receive assistance from institutions where there is no reason to believe that any individual has any particular interest in this thing because he is doing this on a completely voluntary basis to help the committee.

Now, with regard to the last aspect of this, the most difficult situation that we have to contend with is the fact that as was pointed out this morning, cancer in its natural course has a wide variety of growth

rates. There are patients who may live with cancer of the breast for 10 or 12 years without treatment, the disease growing very, very slowly. There are other individuals that may find cancer of the breast not any larger than my small fingernail, in which the patient would be dead in 6 months from rapid dissemination throughout the entire body. Therefore it presents much for us to review with regard to the natural history of the disease.

Attempts have been made in this regard by myself and another individual some years ago, and by English workers and by others working in this country now proceeding along the same line. In order for us to understand if an individual's life expectancy can be increased we must know what the cancer will do in its natural course. This is very difficult to evaluate. Also we have to take into consideration what we call subjective response to a treatment, which does not necessarily mean that it has an effect on the tumor. Subjective response is a feeling of well-being on the part of the patient, which may be accomplished by a number of measures. It may be relief of the pain, which may be a very difficult thing to evaluate. It may be a sense of well-being in a sense that the patient says he feels better or it may be other factors psychologically which enter into this, with the patient having the idea that something is being done, and that is a very important consideration.

But if one looks at this scientifically as one should, we have to depend upon what we call objective response. What happened to the cancer, because if the cancer undergoes certain changes and begins to slow down in growth or becomes smaller in size, generally the patient improves without any question. Her weight might increase and her appetite might also increase and she wants to go back to her housework and get out of bed. These measures can be accomplished by several agents. These are objective responses. In other words, I am trying to distinguish between the expression "I feel well" as against "What has really happened to the tumor?"

We have measurements for this type of thing, which were alluded to this morning, chemical measurements, which will tell us whether a tumor is undergoing a good response. We have X-rays to tell us whether lung tumors have become smaller under treatment. Again, by means of X-rays, we can tell if bone diseases, cancers of the bone, are improved by the changes in the bone which tend to return to normal. We have these objective measurements which lead us to believe that if these things do exist even in a few patients, we must then go ahead and really look into the situation. We must remember also—and I am going to close by saying this: That cancer may also undergo spontaneous changes. In other words, some cancer may disappear without any treatment that we know of. This is characteristic of some types of cancer. One type is the so-called malignant mole or malignant malinoma, which may spread very rapidly and then, for some reason or other, disappear. It does not mean it will not appear again. There are examples of such cases. Cancer may grow in spurts and it may slow down for a year or two and then increase in size again. As Dr. Farber pointed out this morning the cancer may be quiet and for some reason it appears again.

Therefore, in closing, I would like to say our committee is making every attempt to critically, neutrally evaluate any proposal that is

presented to us in the same ways as those presented to us through the ordinary scientific journals. The methods by which we do this are the same methods by which we ourselves do our own research work and we have set up standards identical to those set up for ourselves which are accepted methods for cancer therapy and diagnosis.

Thank you very much.

The CHAIRMAN. Doctor, this has been a very interesting statement that you have made and I think that the work of this committee is exceedingly important, because in our groping, so to speak, there is a desire to get the ultimate result.

We can readily realize that in cases such as this disease there may be many well-intentioned individuals who have seen some improvement as the result of some particular treatment and who feel that they have the answer.

On the other hand, it may be that the proposed remedy has no value whatsoever, and it was only incidental that it seemed to have value.

Now, I take it that your organization seeks, so far as you can with the knowledge that is available to you, and with the assistance of such chemists and laboratory tests and what not, to try to evaluate in the interest of the people these different remedies that come to your attention.

Under the circumstances, I would assume that you would be unable to make a complete study unless the individual who possesses the particular so-called remedy or treatment is willing to make it available to your committee in all of its detail; is that right?

Dr. NATHANSON. That is correct, sir.

The CHAIRMAN. Well, I can readily understand that if you do not have the details you could hardly be expected to express a judgment that would be good.

Now, in the event that there is a proposed therapy, and the individual who has it fails to supply the necessary detailed information to the committee for evaluation, I take it, then, that there is no general action taken by your committee with respect to that particular remedy, due to the inusufficiency of the details that are presented to you?

Dr. NATHANSON. That is correct.

The CHAIRMAN. Their failure or refusal to do so?

Dr. NATHANSON. That is correct, sir.

The CHAIRMAN. Are there any further questions, gentlemen?

Dr. HELLER. Mr. Chairman, may I make a statement?

The CHAIRMAN. Yes, sir.

Dr. HELLER. Mr. Chairman, we shall avail ourselves of your invitation to submit additional data that you would like to have in the record and with your permission we shall submit to the clerk of your committee such additional information.

I should also like to say, sir, on behalf of the panel, since this was our final panelist, that we appreciate tremendously the graciousness of the chairman, the courteous attention of the committee and the opportunity to appear here to explain cancer research, cancer control, and the opportunities to submit to the Congress the progress that has been made so that you may be better informed of this particular important activity. Thank you, sir.

The CHAIRMAN. Dr. Heller, before I reply directly to what you have just said, I want to give Mr. Teeter of the Damon Runyon Foundation an opportunity to present any facts that he may wish in connection with that fund.

STATEMENT OF JOHN TEETER, DAMON RUNYON FOUNDATION

Mr. TEETER. Mr. Chairman, may I present this statement to the committee and I will not take your time, because it is in more detail than I would be able to give to the committee.

The CHAIRMAN. Yes, sir, you certainly may.

(The matter referred to is as follows:)

DAMON RUNYON FUND, SEPT. 25, 1953

Total contributions to date	$7,818,652.40
Total grants to date	7,250,386.65
Balance on hand	568,265.75

Never a penny deducted for expenses of any kind.

DAMON RUNYON MEMORIAL FUND FOR CANCER RESEARCH, INC., NEW YORK, N. Y.

MEMO RE THE DAMON RUNYON FUND

Damon Runyon died December 10, 1946. The following Sunday night Walter Winchell founded the Damon Runyon fund by asking for nickels, dimes, and dollars to help fight cancer. Before Damon died, from cancer of the throat, he had scribbled a note to Walter: "You can keep the things of bronze and stone; give me one man to remember me once a year."

This monument has now reached $7,818,652, measured in dollars for want of a better measuring stick. Perhaps a more permanent recognition is in the 388 grants and 256 fellowships given in 170 institutions in 47 States, the District of Columbia, and 14 foreign countries. And all this without deducting a penny for expenses. Mr. Winchell and a few friends pay all expenses through the Walter Winchell Foundation. Even then, these expenses are less than 5 percent of the sum collected by the fund; $7,246,786 has been allocated in grants and fellowships.

The fund is devoted entirely to seeking the cause and control of cancer, by supporting cancer research and training men to conduct this research. If the disease can be brought under control by research the annual economic loss to the Nation can be brought within manageable proportions. Over 200,000 die each year from cancer, another 600,000 suffer. The annual hospitalization cost of those who die exceeds $300 million. The limited funds of private agencies cannot hope to meet the cost of patient care. For this reason the fund concentrates on research seeking the cause and control of cancer.

The Damon Runyon fund was incorporated in New York State in 1947 and enjoys Federal tax exemption. Organizationally it includes members, directors, and officers. Membership is unlimited. Directors may be not more than nine. Officers are elected by the directors. Members elect the directors.

Members: Dan Parker, Leo Lindy, Walter Winchell, Arthur Godfrey, Milton Berle, Robert Christenberry, John Daly, Marlene Dietrich, Joe DiMaggio, Morton Downey, Bob Hope, Louis R. Lurie, Sugar Ray Robinson, and Paul Small.

Directors: Dan Parker, Leo Lindy, Walter Winchell, Arthur Godfrey, Robert Christenberry, Morton Downey, Louis R. Lurie, Clendenin J. Ryan, and Paul Small.

Officers: Dan Parker, president; Bob Hope, assistant to president; Leon Lindy, vice president; Walter Winchell, treasurer; and Arthur Godfrey, secretary.

All of the above men and women serve without compensation. Functionally, the fund receives contributions from any source and sends out receipts and "in memory" cards in time of death or any other suitable occasion. There is no regular drive. Most of the funds come from special events, such as the Tournament of Champions. There have been 143 bequests from estates totaling $800,000. A remarkable record for so young a fund.

Any institution or graduate M. D. or Ph. D. may apply to the fund for the support of a cancer-research project within the institution or for a Damon Runyon Fund Fellowship. Application is made on forms obtained from this office. They are reviewed monthly by the attached committee of scientists and doctors specializing in cancer. Applications are graded competitively. Approximately one-third of the best applications are approved, that being the maximum

possible for the money available. The recommendations of this committee—also serving without compensation—are forwarded by the executive director, John H. Teeter, to the officers of the fund, who are asked to approve or disapprove. The fund is unique in that it passes on grants monthly. The Government agency, the National Cancer Institute, takes almost a year and the American Cancer Society over a year. Each grantee is required to submit a budget and file a progress report. The fund spot checks expenditure reports and reviews progress reports.

Ten million dollars spent annually on cancer research is the largest medical-research effort in the world. The Runyon fund's share is about $1,300,000. The National Cancer Institute (Government) and the American Cancer Society carry about $3,500,000 each and the Atomic Energy Commission and other smaller agencies, the balance. The Runyon fund is the only agency devoted entirely to research—supporting salaries, equipment, and expendable supplies used in cancer research. We do not provide money for bricks and mortar (buildings).

The cause of cancer is not known—but its control is within the possibility of research. The combined efforts of the agencies in the field are tied together in a radial fashion—much like the hub and spokes of a wagon wheel. There are competing teams working on the same unsolved problems—but not needless duplication.

Organized cancer research started in 1945. The Runyon fund entered the team in 1947. Chemicals to control cell growth, and differentiate between cancer and normal cells are being developed and tested—more than 5,000 so far. X-ray methods are being improved, voltages in the millions, and the poor man's radium (the cobalt bomb), are credits to the fund. Improved surgery, sometimes known as radical or experimental surgery, is currently saving lives considered hopeless 2 years ago. As parts of the cancer puzzle fit into the total research effort there is reason to believe cancer control is possible within our life span.

The prominence of the fund's membership results in many calls for guidance in patient care. Advice is given, but no funds are available for patient care. Many sincere and honest people believe they have a cure for cancer—but sincerity and honesty are not substitutes for competence where human life is at stake. The Committee for Cancer Diagnosis and Therapy, 2101 Constitution Avenue, Washington, D. C., has been created by the cancer agencies, including the Runyon fund, to meet the prolific reports of cures and to screen those whose claims of cures are unproven in medical and scientific channels. All cancer-therapy claims may be referred to this unbiased committee. There is no reason for any person or group to claim persecution. The fund does, however, insist that any research project be judged competitively—there are no back doors for grants based on pressure.

The pen and microphone of the fund's treasurer have served a most useful public service in bringing the word "cancer" into public use. An even greater service has been the exposé of cancer fund raising frauds and those claiming cures. This has been a one-man task in which no other single individual could have been so useful to the public. Every dollar saved from frauds or questionable cures is a dollar available for the Damon Runyon Fund.

JOHN H. TEETER.

DAMON RUNYON FUND ADVISORY COMMITTEE

Dr. Emerson Day, Strang Cancer Prevention Clinic, 419 East 68th Street, New York 21, N. Y.

Dr. Anthony J. Lanza, New York University, Bellevue Medical Center, Institute of Industrial Medicine, 477 First Avenue, New York City.

Dr. Antonio Rottino, St. Vincent's Hospital, 7th Avenue and 11th Street, New York City.

Dr. Howard Canning Taylor, Jr., Columbia Presbyterian Medical Center, 630 West 168th Street, New York City.

Dr. Albert Tannenbaum, Michael Reese Hospital, 29th Street, and Ellis Avenue, Chicago 16, Ill.

Dr. John G. Trump, Massachusetts Institute of Technology, Cambridge 39, Mass.

Prof. J. A. Reyniers, Lobund Institute, University of Notre Dame, Notre Dame, Ind.

Prof. M. J. Kopac, New York University, Washington Square College of Arts and Sciences, Washington Square 3, N. Y.

Prof. Cavett O. Prickett, E. I. du Pont de Nemours & Co., Grasselli Division, Wilmington 98, Del.

DAMON RUNYON CANCER RESEARCH FELLOWSHIPS

The Damon Runyon Memorial Fund for Cancer Research, Inc., awards a number of postdoctoral fellowships on recommendation of its Scientific Advisory Committee. The Scientific Advisory Committee, consisting of nine members, represents both medical and nonmedical aspects of cancer research. These fellowships are not intended for the training of clinicians; they support young investigators whose research potential may be further developed by association with an outstanding investigator or research group.

Eligibility

Men and women, of excellent character, who have received their doctorates in medicine, philosophy, or science, or who have completed all requirements leading toward doctoral degrees are eligible for Damon Runyon cancer research fellowships. The degree must have been earned in a recognized institution, and the applicant must have demonstrated unusual ability to conduct original and independent research. Applicants who have already held 3 years of postdoctoral fellowships from this or other agencies are ineligible.

General policy

The applicant may choose to work in any area within the broad fields of basic or applied cancer research. There is no restriction concerning the institution or sponsor except that both must be of excellent scientific or medical standing. In special circumstances, fellows may be permitted to train outside the United States.

Preference is given to young investigators; in exceptional instances, an established individual may be given a fellowship to acquire some special skill. Experienced investigators, who are without responsible or permanent posts, are rarely awarded fellowships since support of their research project should come from institutional funds or grants.

Although the main purpose of a fellowship is training in research, a fellow may spend a few hours per week in teaching or clinical work. Such activity is justified only if it benefits his special training. Private practice is not permitted; nor is the fellow allowed to earn other income during tenure of a Damon Runyon cancer-research fellowship.

Fellowships may be renewed for a second year and possibly for a third year. The Damon Runyon Memorial Fund does not, as a general policy, support research fellowships beyond 3 years.

Renewal of fellowships shall be contingent on the following: (1) the fellow has demonstrated capacity to work originally and independently; (2) the institution has the facilities and stimulation to extend the fellow's training and points of view; and (3) the sponsor's appraisal of the fellow, in a confidential report, indicates that his abilities are exceptional. No renewal application will be considered unless this report is submitted.

A fellow may remain in the same institution during continuation years of a fellowship, or may work at several institutions or laboratories. All such arrangements are subject to approval by the Scientific Advisory Committee, and must be consistent with the primary aim of the fellowship which is to develop the fellow's research potential.

The sponsor

A research fellowship is intended to augment the training of an individual who has already demonstrated ability to conduct original research. The sponsor shall see that the fellow, in fact, will receive additional training not only in learning new techniques, but also in obtaining a wider grasp of the broader problems in the fellow's field of investigation. It is expected that fellows will participate in seminars and conferences.

At the time a fellow applies for a renewal, the sponsor shall submit a complete and objective report in accordance with the form supplied by the office of the Damon Runyon Memorial Fund. This confidential report is the principal consideration upon which the scientific advisory committee makes its decision.

The followship is for the training of the fellow—and not for the convience of the sponsor. It must be directed toward the development of the fellow and not necessarily toward the completion of the sponsor's research project.

Stipend

The basic annual stipend for a Damon Runyon cancer-research fellowship is $3,600, and an additional $600 may be available for each dependent (at the time the fellowship is awarded). Renewals may be increased by $600, except that in no instance will the total exceed $6,000 per year.

Certain allowances for travel may be granted. These requests are subject to the approval and recommendation of the Scientific Advisory Committee.

Fellows may take vacations consistent with the policies of the institution in which the fellowship is held. The maximum vacation, however, will not exceed 1 month for each fellowship year.

Federal income tax

At the time the applicant is informed of the fellowship award, a statement from the Bureau of Internal Revenue will be included which defines the status of the fellowship stipend. At the present time, a research fellowship is considered as a gift or gratuity to permit training and not as a payment for services rendered. It is not, therefore, subject to withholding or income tax. This ruling, however, may be changed without further notice.

Annual conference

Each year the Damon Runyon Memorial Fund in cooperation with the New York Academy of Sciences, will hold a 2-day conference for current and former Damon Runyon cancer-research fellows. Each fellow is invited to present a paper summarizing the results of his investigations. There will be ample opportunity for discussion not only at the sessions, but also it is expected that the fellows will hold informal discussions of their own. During the conference the participating fellows will be guests of the Damon Runyon Memorial Fund which assumes the costs of travel to New York City.

Reports and publications

Although participation in the annual conference will constitute a part of the report, fellows are expected to submit a full progress report prior to application for renewal or at the termination of the fellowship. These reports become part of the record of the fellow.

Fellows are encouraged to attend scientific meetings especially, those related to cancer. They should feel free to contribute papers limited only by the specific rules and regulations of the organizations or societies sponsoring the meetings. The Damon Runyon Memorial Fund cannot assume any of the expenses for attending such meetings.

Fellows are also encouraged to publish their results in recognized scientific or medical journals, subject only to the editorial policies of the journals selected. It is requested that whenever a publication appears as a result of a fellowship there will be a footnote on the title page acknowledging support of the Damon Runyon Memorial Fund. The preferred phrasing of the footnote is the following:

Damon Runyon cancer research fellow

The fellow will send 10 copies of each reprint to the office of the Damon Runyon Memorial Fund.

Application for fellowships

An applicant may obtain the proper forms, and instructions for preparing them, from the office of the Damon Runyon Memorial Fund. Applications are acted upon during the meetings of April, July, and September; for consideration at these meetings and to leave ample time for processing, it is imperative that applications be submitted by January 1, April 1, and September 1, respectively. Fellowships must be activated within a reasonable time after notice of award.

Former fellows of the Damon Runyon Memorial Fund

The office of the Damon Runyon Memorial Fund receives daily inquiries from individuals seeking information on some cancer problem. The executive director will continue to refer many of these letters to former fellows who are now established in responsible positions. From time to time, former fellows may suggest or propose applicants for fellowships. On occasion, they may be called upon to interview an applicant.

The executive director wishes to maintain a complete file of all fellows, former and current, and expects to be informed of promotions, or of any changes in position or address. Likewise, the executive director will be pleased to receive immediate information about advances in cancer research made by former fellows.

All inquiries in reference to Damon Runyon cancer research fellowships are to be sent to: Mr. John H. Teeter, executive director, Damon Runyon Memorial Fund for Cancer Research, Inc., Hotel Astor, Broadway and 44th, New York 36, N. Y.

Prepared for the S. A. C.

M. J. KOPAC.

Damon Runyon Memorial Fund for Cancer Research, Inc.—Geographical summary, cancer research program as of Sept. 30, 1953

	Institutional grants		Fellowships		State totals	
	Number	Amount	Number	Amount	Number	Amount
State:						
Alabama	5	$42,612.00			5	$42,612.00
Arizona	1	6,000.00			1	6,000.00
Arkansas	1	15,562.00			1	15,562.00
California	24	462,965.00	9	$37,068.70	33	500,033.70
Colorado	5	65,300.00			5	65,300.00
Connecticut	4	65,250.00	3	14,450.00	7	79,700.00
Delaware	2	9,800.00			2	9,800.00
District of Columbia	12	118,014.00	2	7,667.00	14	125,681.00
Florida	10	192,585.00			10	192,585.00
Georgia	1	10,000.00	1	3,156.25	2	13,156.25
Idaho	2	20,000.00			2	20,000.00
Illinois	9	280,360.00	9	37,143.44	18	317,503.44
Indiana	6	113,500.00			6	113,500.00
Iowa	3	10,800.00			3	10,800.00
Kansas	6	72,000.00	3	10,750.00	9	82,750.00
Kentucky	11	73,440.00			11	73,440.00
Louisiana	3	35,000.00			3	35,000.00
Maine	1	50,000.00			1	50,000.00
Maryland	5	112,597.00	8	31,161.70	13	143,758.70
Massachusetts	24	395,312.00	48	218,452.63	72	613,764.63
Michigan	3	39,884.00			3	39,884.00
Minnesota	6	96,500.00	9	41,500.00	15	138,000.00
Missouri	9	129,340.00	7	26,900.00	16	156,240.00
Montana	2	16,600.00			2	16,600.00
Nebraska	2	20,000.00			2	20,000.00
Nevada	1	5,000.00			1	5,000.00
New Hampshire	1	7,000.00			1	7,000.00
New Jersey	7	68,007.00			7	68,007.00
New Mexico	4	20,400.00			4	20,400.00
New York State	118	1,711,294.02	94	1,317,301.71	212	3,028,595.73
New York City	110	1,617,935.00	91	1,306,051.71	201	2,923,986.71
North Carolina	4	107,692.00	9	40,750.00	13	148,442.00
North Dakota	2	10,200.00			2	10,200.00
Ohio	9	83,789.24			9	83,789.24
Oklahoma	3	40,000.00			3	40,000.00
Oregon	3	63,000.00			3	63,000.00
Pennsylvania	18	150,004.41	22	96,031.90	40	246,036.31
Rhode Island	6	40,522.00			6	40,522.00
South Carolina	1	5,000.00			1	5,000.00
South Dakota	2	5,000.00			2	5,000.00
Tennessee	5	20,519.00	1	4,100.00	6	24,619.00
Texas	10	148,335.00	5	22,850.00	15	171,185.00
Utah	4	16,300.00	5	23,300.00	9	39,600.00
Vermont	1	5,400.00			1	5,400.00
Virginia			1	4,000.00	1	4,000.00
Washington	4	56,175.00	2	7,000.00	6	63,175.00
West Virginia	2	15,000.00			2	15,000.00
Wisconsin	5	24,500.00			5	24,500.00
Wyoming	2	5,000.00			2	5,000.00
Total, United States	360	5,061,558.67	238	1,943,583.33	607	7,005,142.00
Foreign countries:						
Belgium	1	10,000.00			1	10,000.00
Canada	2	10,000.00	11	46,444.65	13	56,444.65
England	2	20,000.00	4	16,900.00	6	36,900.00
Finland	1	5,000.00			1	5,000.00
France	1	10,000.00			1	10,000.00
Germany	1	200.00			1	200.00
Ireland	1	10,000.00			1	10,000.00
Israel	4	55,000.00			4	55,000.00
Italy	1	10,000.00			1	10,000.00
Mexico	2	10,000.00			2	10,000.00
Norway	1	10,000.00			1	10,000.00
Scotland	1	10,000.00			1	10,000.00
Sweden	1	5,000.00	3	13,000.00	4	18,000.00
Total, foreign	19	165,300.00	18	76,344.65	37	241,644.65

Total United States	$7,005,142.00	607
Total, foreign	241,644.65	37
Grand total	7,246,786.65	644

NOTE.—To date, $7,246,786.65 has been allocated in 388 grants and 256 fellowships, in 170 institutions, in 47 States, the District of Columbia, and 14 foreign countries.

Damon Runyon Memorial Fund for Cancer Research, Inc.—Geographical breakdown of allocations, Aug. 31, 1953 (see next table for September allocations)

	Total		State total
	Institutions	Amount	
Alabama:			
Alabama Polytechnic	1 GIA	$3,600.00	
Baptist Hospital	1 GIA	7,087.00	
Tuskegee Institute	3 INST	31,925.00	
			$42,612.00
Arizona: Arizona State	1 INST	6,000.00	6,000.00
Arkansas: University of Arkansas	1 INST	15,562.00	15,562.00
California:			
American Cancer Society, California	1 INST	100,000.00	
American Cancer Society, Los Angeles	1 INST	40,000.00	
California Institute of Technology	2 INST	20,000.00	
Institute of Medical Research	2 INST	15,000.00	
Mercy Hospital	1 INST	10,000.00	
Mount Zion Hospital	5 INST	33,100.00	
Stanford University	4 INST	35,133.00	
University of California	6 INST	183,870.00	
	8 F	32,268.70	
University of Southern California	2 INST	25,862.00	
			495,233.70
Colorado: University of Colorado	1 GIA	2,500.00	
	4 INST	62,800.00	
			65,300.00
Connecticut: Yale University	3 F	14,450.00	
	4 INST	65,250.00	
			79,700.00
Delaware: University of Delaware	2 INST	9,800.00	9,800.00
District of Columbia:			
George Washington University	2 F	7,667.00	
	4 INST	55,000.00	
Howard University	4 INST	48,014.00	
National Academy of Science	3 INST	7,500.00	
Children's Hospital	1 INST	7,500.00	
			125,681.00
Florida:			
Dade County Cancer Institute	2 INST	14,800.00	
Florida Southern College	3 INST	7,785.00	
University of Florida	4 INST	95,000.00	
University of Miami	1 INST	75,000.00	
			192,585.00
Georgia:			
Medical College of Georgia	1 F	3,156.25	
Emory University	1 INST	10,000.00	
			13,156.25
Idaho:			
University of Idaho	1 INST	18,000.00	
St. Luke's Hospital	1 INST	2,000.00	
			20,000.00
Illinois:			
Chicago Tumor Clinic	1 INST	25,000.00	
University of Chicago	7 F	28,143.44	
	5 INST	227,000.00	
Michael Reese Hospital	2 INST	23,500.00	
	2 F	9,000.00	
			312,643.44
Indiana:			
Indiana University	2 INST	27,500.00	
University of Notre Dame	4 INST	86,000.00	
			113,500.00
Iowa: State University of Iowa	3 INST	10,800.00	10,800.00
Kansas:			
University of Kansas	2 F	6,750.00	
	3 INST	60,000.00	
St. Margaret's Hospital	1 F	4,000.00	
	3 INST	12,000.00	
			82,750.00
Kentucky:			
American Cancer Society Cancer Kentucky Mobile	1 INST	10,000.00	
University of Louisville	7 INST	57,440.00	
Ursuline College	3 INST	6,000.00	
			73,440.00
Louisiana: Tulane University	1 GIA	5,000.00	
	2 INST	30,000.00	
			35,000.00
Maine: Jackson Memorial Laboratory	1 INST	50,000.00	50,000.00

Damon Runyon Memorial Fund for Cancer Research, Inc.—Geographical breakdown of allocations, Aug. 31, 1953—Continued

	Total		State total
	Institutions	Amount	
Maryland:			
Johns Hopkins University	8 F	$31,161.70	
	2 INST	60,000.00	
University of Maryland	1 INST	25,000.00	
Maryland Division	1 INST	26,000.00	
Carnegie Institution of District of Columbia	1 GIA	1,597.00	
			$143,758.70
Massachusetts:			
Beth Israel Hospital	3 F	13,250.00	
Brigham Hospital	6 F	24,100.00	
Massachusetts Memorial Hospital	1 F	4,250.00	
Free Hospital for Women	1 INST	5,500.00	
Harvard Medical School	3 INST	30,000.00	
Massachusetts General Hospital	7 F	34,900.00	
	6 INST	190,647.00	
Massachusetts Institute of Technology	3 F	11,600.00	
	3 INST	36,000.00	
New England Center Hospital	9 F	40,450.00	
Pratt Diagnostic Clinic	5 F	19,574.50	
Boston City Hospital	5 F	27,178.12	
Scientific Special Corporation	1 INST	10,000.00	
Tufts College	7 F	34,750.00	
	5 INST	79,765.00	
University of Massachusetts	1 INST	3,000.00	
Worcester Foundation for Experimental Biology	4 INST	40,400.00	
			605,364.62
Michigan:			
Detroit Institute	1 INST	25,000.00	
University of Michigan	2 INST	14,884.00	
			39,884.00
Minnesota:			
University of Minnesota	9 F	41,500.00	
	5 INST	92,500.00	
St. Scholastica College	1 INST	4,000.00	
			138,000.00
Missouri:			
St. Louis City Hospital	1 F	4,000.00	
St. Louis University	4 INST	70,000.00	
	1 F	3,600.00	
Washington University	5 F	19,300.00	
	1 GIA	8,000.00	
	4 INST	51,340.00	
			156,240.00
Montana: University of Montana	2 INST	16,600.00	16,600.00
Nebraska: University of Nebraska	2 INST	20,000.00	20,000.00
New Mexico: University of New Mexico	3 INST	15,600.00	15,600.00
Nevada: University of Nevada	1 INST	5,000.00	5,000.00
New Hampshire: Hitchcock Foundation	1 INST	7,000.00	7,000.00
New Jersey:			
Princeton University	1 GIA	1,000.00	
Rutgers University	5 INST	63,007.00	
St. Peters General Hospital	1 INST	4,000.00	
			68,007.00
New York State (without N. Y. C.):			
Buffalo General Hospital	2 F	7,000.00	
	2 INST	25,920.02	
Bassett Hospital	1 F	4,250.00	
University of Rochester	2 INST	38,146.00	
Trudeau Foundation	3 INST	29,293.00	
			104,609.02
New York City:			
Brooklyn Polytechnic	2 INST	30,000.00	
Columbia University	16 F	76,186.45	
	16 INST	293,080.00	
Committee for Promoting Medical Research	1 INST	10,000.00	
Cornell University	1 F	4,019.15	
American Cancer Society (New York City)	5 F	880,000.00	
American Museum of Natural History	5 INST	55,000.00	
Fordham University	4 INST	26,650.00	
Genetic Society of America	1 INST	11,000.00	
Harlem Hospital	4 INST	36,295.00	
Hickrill Chemical Research	2 INST	16,600.00	
Lenox Hill Hospital	1 INST	10,000.00	
Memorial Center	63 F	301,346.11	
	24 INST	580,827.00	
Montefiore Hospital	3 INST	27,500.00	
Mt. Sinai Hospital	1 INST	10,000.00	
	1 F	4,800.00	

Damon Runyon Memorial Fund for Cancer Research, Inc.—Geographical breakdown of allocations, Aug. 31, 1953—Continued

	Total		State total
	Institutions	Amount	
New York City—Continued			
New York Academy of Sciences	3 INST	$20,222.00	
New York Medical College	4 INST	29,220.00	
New York University—Bellevue and Washington Square College.	12 INST	241,817.00	
	5 F	24,000.00	
New York City College	2 INST	1,150.00	
Presbyterian Hospital	2 INST	12,954.00	
Rockefeller Institute	2 F	7,600.00	
St. Claire's Hospital	1 INST	10,000.00	
St. Luke's Hospital	3 INST	12,000.00	
St. Vincent's Hospital	3 INST	30,500.00	
Brooklyn Cancer Hospital	1 F	4,500.00	
St. Catherine's Hospital	1 INST	10,000.00	
Jewish Hospital	1 INST	10,000.00	
New York Zoological Society	1 INST	2,500.00	
			$2,789,776.71
North Carolina:			
Duke University	2 INST	87,000.00	
	9 F	40,750.00	
	1 GIA	10,000.00	
University of North Carolina	1 INST	10,692.00	
			148,442.00
North Dakota: University of North Dakota	2 INST	10,200.00	10,200.00
Ohio:			
St. Mary's of Springs	1 INST	1,500.00	
Institute Divi Thomae	1 INST	5,000.00	
Jewish Hospital Association	1 INST	14,500.00	
Ohio State University	1 INST	5,850.00	
University of Cincinnati	3 INST	29,700.00	
Western Reserve University	2 INST	27,239.24	
			83,789.24
Oklahoma: Oklahoma Medical Research Foundation	3 INST	40,000.00	40,000.00
Oregon: University of Oregon	2 INST	46,000.00	46,000.00
Pennsylvania:			
Hahnemann Medical College	1 INST	9,700.00	
Immaculata College	2 INST	6,500.00	
Jefferson Medical College	1 F	4,500.00	
	2 INST	9,215.00	
University of Pennsylvania	16 F	67,748.35	
	3 GIA	10,739.41	
	4 INST	27,000.00	
University of Pittsburgh	3 F	14,783.55	
	1 GIA	1,250.00	
	2 INST	20,000.00	
Institute Cancer Research	2 F	9,000.00	
	2 INST	60,800.00	
Wills Eye Hospital	1 INST	4,800.00	
			346,036.31
Rhode Island:			
Brown University	3 INST	13,372.00	
Providence College	3 INST	27,150.00	
			40,522.00
South Carolina: South Carolina Medical College	1 INST	5,000.00	5,000.00
South Dakota: South Dakota State College	2 INST	5,000.00	5,000.00
Tennessee:			
Oak Ridge Institute	1 F	4,100.00	
University of Tennessee	2 GIA	8,660.00	
	1 INST	3,859.00	
Carson-Newman College	2 INST	8,000.00	
			24,619.00
Texas:			
Southwest Foundation for Research and Education	2 INST	80,000.00	
	1 F	5,400.00	
Odessa College	2 INST	2,385.00	
University of Texas	1 INST	50,000.00	
	2 F	8,600.00	
M. D. Anderson Hospital	1 F	4,250.00	
	3 INST	66,000.00	
Medical Branch	2 INST	10,000.00	
	1 F	4,600.00	
			171,185.00
Utah:			
University of Utah	5 F	23,300.00	
	1 GIA	1,700.00	
	1 INST	10,000.00	
Utah State Agricultural College	2 INST	4,600.00	
			39,600.00
Vermont: University of Vermont	1 GIA	5,400.00	5,400.00

Damon Runyon Memorial Fund for Cancer Research, Inc.—Geographical breakdown of allocations, Aug. 31, 1953—Continued

	Total		State total
	Institutions	Amount	
Virginia: Medical College of Virginia	1 F	$4,000.00	$4,000.00
Washington:			
University of Washington	2 F	7,000.00	
	1 INST	25,000.00	
State College of Washington	1 INST	10,000.00	
Seattle University	1 INST	7,000.00	
Tumor Institute	1 INST	14,175.00	
			63,175.00
West Virginia: Marshall College	2 INST	15,000.00	15,000.00
Wisconsin: University of Wisconsin	3 GIA	4,500.00	
	2 INST	20,000.00	
			24,500.00
Wyoming: University of Wyoming	2 INST	5,000.00	5,000.00
Total United States	595		6,831,072.00
FOREIGN			
Belgium: Institut Jules Bordet	1 INST	10,000.00	10,000.00
Canada:			
McGill University	2 F	7,544.65	
Montreal Cancer Institute	2 INST	10,000.00	
	6 F	26,800.00	
University of Alberta	2 F	8,100.00	
			55,444.65
Finland: Cancer Society of Finland	1 INST	5,000.00	5,000.00
England:			
National Institute Medical Research	1 F	5,500.00	
Imperial Cancer Institute	2 INST	20,000.00	
Cambridge University	3 F	11,400.00	
			36,900.00
France: Laboratory de Genetique	1 INST	10,000.00	10,000.00
Germany: International Residence Commissioner (University of Munich)	1 INST	200.00	200.00
Ireland: Cancer Association	1 INST	10,000.00	10,000.00
Israel:			
Hebrew University	2 INST	20,000.00	
Weizman Institute	2 INST	35,000.00	
			55,000.00
Italy: University of Bologna	1 INST	10,000.00	10,000.00
Mexico: Hospital de Enfermedades	2 INST	10,000.00	10,000.00
Norway: Norwegian Radium Hospital	1 INST	10,000.00	10,000.00
Scotland: Royal Infirmary	1 INST	10,000.00	10,000.00
Sweden:			
Nobel Medical Institute	1 F	6,750.00	
Radium Hemmet	1 E	4,000.00	
	1 INST	5,000.00	
Karolinska Institute	1 F	2,250.00	
			18,000.00
Total foreign	36	237,644.65	237,644.65
Total United States	595		6,831,072.00
Total foreign	36		237,644.65
Grand total	631		7,068,716.65

Symbols:
F—Fellowship grant.
GIA—Grant-in-aid.
INST—Institutional research grant.

Geographical breakdown of allocations for the month of September 1953

	Total	
	Institution	Amount
California: University of California	1 F	$4,800.00
Illinois: Chicago Medical School	1 INST	4,860.00
Massachusetts:		
Massachusetts General Hospital	1 F	4,800.00
New England Center Hospital	1 F	3,600.00
New Mexico: New Mexico Highland University	1 INST	4,800.00
New York City:		
Columbia University	1 INST	79,110.00
American Museum of Natural History	1 INST	10,000.00
Memorial Center	3 INST	41,500.00
Rockefeller Institute	1 F	3,600.00
Oregon: University of Oregon	1 INST	17,000.00
FOREIGN		
Canada: McGill University	1 F	4,000.00

NOTE.—To date, $7,246,786.65 has been allocated in 388 grants and 256 fellowships, in 170 institutions, in 47 States, the District of Columbia, and 14 foreign countries.

The CHAIRMAN. I wish there were more individuals who would take the personal interest in this that Walter Winchell has taken who, in his inimitable way, directs attention to this in a manner that the public understands, and does it on a basis without any cost whatsoever. I understand that he personally bears the entire cost of the administration of it. So, I am gratified to know that some individuals do appreciate the importance of this and the extent of giving all their abilities to carry it on.

Dr. Granger is here of the Food and Drug Administration.

Doctor, do you have any statement that you would like to make at this time?

Dr. GRANGER. No, sir; I have no statement.

The CHAIRMAN. Well, I can readily understand that the Food and Drug Administration in its desire to properly protect the people of the country in accordance with what is expected of it, can only do that to the extent that the necessary funds are supplied by Congress to enable it to do the things that it finds necessary to do with respect to prosecution or otherwise of those who may be taking advantage, or seem to be taking advantage of the public.

Now, in conclusion, I want to say again that I find it as difficult today, as I did yesterday, to express my appreciation on behalf of this committee for the splendid worthwhile service that has been rendered, not only to the committee but we hope through it, to the country, by those who have appeared here today on this panel.

We realize that you are all busy men. You have given time out of your busy life because you are interested in this subject.

It has been most gratifying to us to realize that men of your standing, men of your ability, and men who are inspired as you are to be helpful, are working on this disease that has brought such great distress to our people.

I can only say in these feeble words, "We thank you most heartily for your appearance here today," and for the help that you have given us.

As we proceed with these hearings, opportunity will be given to others who may wish to appear for reasons that are substantial that entitle them to be heard.

This committee has only one desire and that is to be helpful in an objective way. We are in no way going to close the door on anyone who may sincerely and conscientiously feel he has something to contribute which will be of help to the people, whether it be of benefit in regard to this disease or any other disease that this committee will give its attention to during the course of its hearings in the next 2 or 3 weeks.

I cannot say too emphatically that this committee has a desire to be of service, and we will listen in the hope that what is said will enable us—no matter from what source it comes, to be helpful in the prosecution of that which we have taken upon ourselves in making a study of these diseases and finding what can be done to accelerate the progress that is being made toward their elimination.

We thank you.

(The following material was submitted for the record:)

101 Answers to Your Questions About Cancer

These 101 questions have been selected by physicians engaged in health education as those most frequently asked by the layman about cancer. The answers are necessarily brief. For further information, consult your family physician or your State or local office of the American Cancer Society.

1. WHAT IT IS

1. What is cancer?

Cancer is a disorderly growth of cells of the body's tissues. It is not governed by the laws which control the growth of normal cells. If it is not destroyed or removed, it never ceases to grow and eventually causes death.

2. What is the difference between normal and cancerous growth?

Normal growth begins whon the fertilized egg or ovum divides into two cells and it continues, under the control of natural body forces, until maturity is reached. Thereafter growth takes place only to replace injured or wornout tissue.

Cancer arises when a cell or group of cells begins to grow in a wild disorderly manner. The cells of this disorderly growth do not respond to the controls which keep normal cells in check. They force their way among the normal cells in the vicinity and later spread to other parts of the body. This uncontrolled cell growth is cancer.

3. Is cancer contagious or infectious?

As cancer is not due to a germ, it is neither contagious nor infectious. There is no record in medical literature of physicians or nurses having gotten cancer from their patients despite the most intimate contact with them. A person can no more catch cancer from another than he can catch the color of his eyes.

4. Is cancer a blood disease?

No. The only part blood plays in cancer is that of a mechanical carrier of the cancer cells from one part to another of the patient's body. However, cancer may develop in certain tissues which form the cells of the blood.

5. How does cancer spread through the body?

In three ways: (1) Cancer cells grow through the walls of blood vessels and are carried by the bloodstream to distant part of the body; (2) they enter the lymphatic stream in a similar manner and are carried to nearby lymph glands; (3) the cancer cells grow directly from one tissue into another.

6. How fast does cancer grow?

There is no definite rate of growth of cancer tissue. Some types will grow more in a few weeks than other types will in several years.

7. Is cancer a single disease?

No. The term "cancer" includes all forms of malignant growth. Very many varieties are known. These have certain characteristics in common, such as uncontrolled growth, tendency to spread widely in the body, and fatal termination

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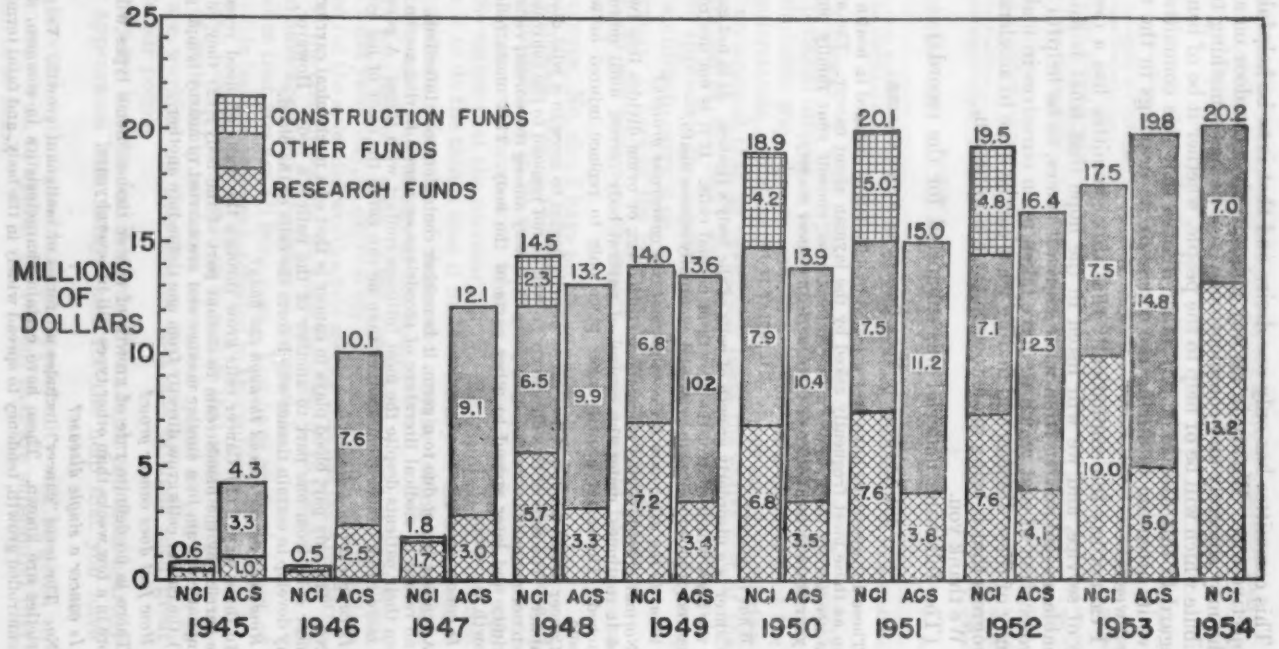

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if not treated early and adequately. They differ in certain characteristics, such as location in the body, microscopic appearance, and response to treatment. Their histories of development may be quite dissimilar and it is probable that the conditions which may precede them also differ greatly.

8. Are all tumors cancerous?

No. Tumors are of two kinds—benign (usually harmless) and malignant or cancer.

9. What is the difference between a benign and a malignant growth?

Benign growths usually have a limiting membrane and push aside the cells of the tissue in which they are found. They never spread to other parts of the body. Malignant cells grow between normal cells, infiltrating the tissues by means of rootlike extensions. Unless adequately treated, cancer cells colonize (metastasize) to other parts of the body.

10. How can we tell if a growth is cancer?

By pathological examination of a small portion of the suspected tissue under the microscope. In advanced cases, physical examination alone of the patient may give the diagnosis. However, when this is possible the growth is often too far advanced to offer much hope of a cure.

11. What is the difference between sarcoma and carcinoma?

The difference is chiefly one of appearance under the microscope and the locations where they grow. Sarcomas are found in connective tissue, carcinomas in epithelial or lining tissue. Both are cancer. Sarcoma is seen more often in younger age groups.

12. Are cancer and leprosy related?

No. Leprosy is a chronic, infectious, contagious disease caused by a germ. While cancer is a chronic disease, it is not infectious or contagious and its cause is obscure.

13. Can lower animals develop cancer?

Yes. Cancer may be found in all forms of life, both plant and animal.

2. WHAT CAUSES IT

14. What causes cancer?

The essential cause is unknown. Many factors are involved, but the most common is some form of chronic or prolonged irritation. This irritation may be of several kinds, as chemical, thermal (heat), or mechanical, as friction.

15. Is cancer caused by a germ?

There is no definite scientific evidence that cancer in humans is caused by a germ.

16. Does cancer come from a single bruise?

A type of bone cancer may rarely result from a single severe injury. It is believed that a single injury to soft tissue, such as the breast, will not cause cancer to develop.

17. What is the relation of food to cancer?

In certain individuals, vitamin B deficiency may result in changes in certain tissues, particularly of the mouth and lips, which may ultimately become cancerous. In general, however, so far as is known, no food or combination of foods has any influence on the cause or cure of cancer.

18. Will irregularity in eating cause cancer of the stomach?

There is no scientific evidence that it will, since cancer of the stomach occurs in people who eat regularly the most healthful foods.

19. Does eating hot foods cause cancer?

There is little evidence that the temperature of food is an important factor in the development of cancer.

20. Does the use of alcohol bear any relation to cancer of the stomach?

Not so far as is known. Alcohol may have an unfavorable effect on stomach tissues of some persons, but no more so than other substances taken into the stomach with food or drink.

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21. Is cancer hereditary in human beings?

There are probably inherited tendencies to form cancer of different types. Since, however, the method of inheriting such tendencies is obscure and undoubtedly complex, the presence of cancer in one or both parents should be merely a cause of greater alertness in looking for and recognizing suspicious conditions on the part of the individual. There is no need of fear or of a fatalistic attitude. The facts do not justify them.

22. Can cancer be transmitted by kissing or casual contact between persons or between persons and animals?

No. There is no authentic record of cancer having been transmitted by kissing or by any contact, accidental or otherwise, either between persons or between persons and animals.

23. Do corns ever become cancerous?

Cancer may occur in any tissue of the body, but since a corn consists entirely of nonvital cells it could not in itself develop cancer.

24. Do freckles ever turn into cancer?

Simple freckles do not. However, flat moles containing certain pigment of a bluish-black color and looking like dark freckles, may become cancers and should be checked periodically.

25. Do hemorrhoids turn into cancer?

No. Hemorrhoids are enlarged veins in the rectal wall. Cancer is occasionally found in the tissue above the hemorrhoids, so "bleeding piles" should be examined carefully to determine whether cancer is present.

26. Can one's mental condition influence the course of cancer?

Not so far as is known. Cancer is a disease of body cells. One's mental condition has no effect on the course of the disease since this malignant change is apparently due to physical rather than mental processes.

3. DEFENSE MEASURES

27. How can one guard against cancer?

By preventing, so far as possible, prolonged irritation to any part of the body. Specifically, protection from overexposure to the sun and wind, prompt repair of all birth injuries to the womb, permitting the breasts to function normally, repair of jagged teeth, avoidance of ill-fitting dental plates, self-control in using tobacco, correction of chronic constipation—in short, elimination of unnecessary abuse of any tissue is a commonsense method of helping to guard against cancer.

28. What is meant by a "precancerous lesion"?

Any abnormal condition that, if permitted to continue, may develop into cancer.

29. What are some of the more important precancerous lesions?

White spot disease on mucous membrances, especially of the mouth; dry, scaly, itching patches on the skin, particularly the face; sores caused by jagged teeth and ill-fitting dental plates; dark colored moles subject to irritation; unrepaired injuries due to childbirth. These should all be investigated by a physician.

30. What precautions should be taken to avoid cancer of the mouth?

Keep the mouth clean. Have jagged teeth repaired or removed. Do not use an ill-fitting dental plate which causes a sore on the gums. If white spots appear in the mouth or on the tongue, stop the use of tobacco and see a doctor.

31. What precautions should be taken to avoid cancer of the skin?

Dark colored moles and warts, if subject to irritation, should be removed. Itching, scaly patches on the skin should be treated before they become open sores. Fair-skinned people, especially, should avoid continuous overexposure to direct sun rays. Recurrent fever blisters on the lip should be carefully examined. Keep the skin clean.

32. Should all moles be removed?

No. A flat colorless mole is probably as harmless as a freckle. Bluish-black hairless moles, especially when subject to irritation, should be removed. Any

mole or wart showing change in size or color should be promptly and completely removed and the removed tissue examined by a pathologist to determine if cancer is present.

33. Can immunity to cancer be acquired as with diphtheria or typhoid fever?

Production of immunity is possible only in diseases caused by germs. As cancer is not in this class, immunity cannot be developed against it.

34. Why do many people wait before consulting a physician when cancer may be present or suspected?

Primarily because of fear or ignorance of the signs of cancer and of the vital importance of securing treatment early. Some people also think there is a social disgrace in having cancer and so hide the fact from their physicians and often from friends and relatives. This is not a justifiable attitude.

35. Can a tuberculous person ever have cancer?

He can. The presence of tuberculosis or any other disease gives no assurance that cancer may not also develop.

36. Why don't the white corpuscles in the blood kill cancer cells?

The chief function of white blood corpuscles is to protect the body against bacteria or germs. They kill germs and combat infection. They have no effect on cancer cells.

37. How can we control cancer?

First, by a prompt visit to a physician when suspicious signs or symptoms appear. Intelligent alertness by the individual may well save his life.

Second, by having complete, annual physical examinations. Women over 35 should be examined twice a year.

Third, by the physician's "high index of suspicion" of cancer in all patients.

Fourth, by diagnosis at the earliest possible moment, followed by adequate treatment.

Fifth, by a widespread knowledge, both lay and professional, of the character of cancer, its causes, method of spreading, the value of early diagnosis and adequate treatment, and means of protection.

Support of such organizations as the American Cancer Society is essential.

4. HOW TO DETECT IT

38. How can you tell if you have cancer without seeing a doctor?

You cannot. A regular thorough physical checkup by your family physician is your best guard against cancer, plus an examination when one of the seven danger signals or warnings appears. You are the first line of defense against cancer because you, and you alone, can recognize a danger signal and heed its warning.

39. What are some of the early signs of cancer?

There are seven common ones. They are often called the seven danger signals of cancer.

1. Any sore that does not heal.
2. A lump or thickening in the breast or elsewhere.
3. Unusual bleeding or discharge.
4. Any change in a wart or mole.
5. Persistent indigestion or difficulty in swallowing.
6. Persistent hoarseness or cough.
7. Any change in normal bowel habits.

You should go at once to a doctor upon the appearance of any one of them. Memorize this list.

40. Is pain an early symptom of cancer?

No, except in a cancer of bone or nerve tissue. Pain usually is a late symptom and when it comes the growth is often far advanced.

41. Why should cancer be diagnosed and treated early?

The sooner it is found the less likely it is to have spread to other parts of the body where successful removal is impossible.

42. How long is it safe to wait after suspicious symptoms appear before consulting a physician?

Any delay is dangerous. Go at once to a doctor and ask for a thorough examination.

43. Why are periodic examinations necessary?

The earlier a cancer is treated the greater the chance of a cure. Through periodic examinations cancer may be detected in its early stages, before the individual has noticed any sign or symptom in himself.

44. What should comprise a thorough physicial examination?

Careful inspection of the entire body surface. Heart, blood vessel, and lung examination. Examination by sight and touch of accessible organs, such as the mouth, nostrils, ears, throat, chest, breasts, womb, and rectum. Examination of stomach and intestines by X-ray when indicated. Microscopic examination of blood, urine, and any suspected tissue. In women, special examination of the breasts. Other examinations as indicated, as of the eye, bladder, and prostate by appropriate methods.

45. Is bleeding always a sign of cancer?

No, but bleeding should be promptly and carefully investigated to determine if it is due to cancer. A small percentage of bleeding nipples are due to cancer. Bleeding from other body openings, as rectum or bladder, should be carefully investigated to rule out cancer. Unnatural vaginal bleeding, especially after the change of life, is always suspicious.

46. Does blood in bowel movements indicate cancer?

Movements streaked with bright blood or the occurrence of black or tarry stools should have prompt and thorough investigation. The assumption that rectal bleeding is merely due to hemorrhoids, or piles, is most dangerous since such bleeding may be due to a multiplicity of causes, including cancer, which require prompt treatment.

47. Does blood in the urine indicate cancer?

It may, but it may also be caused by conditions other than cancer. A careful examination is essential to rule it out.

48. Is it true that cancer generally develops among people in poor health?

There is no known relation between the status of one's health and the development of cancer. Regular checkups by your physician at your request provide the best safeguard against cancer as well as against other types of disease.

49. How can we diagnose cancer of the stomach?

The best method is X-ray. The outline of the interior of the stomach when filled with a dense substance, as barium sulfate, will often give clues to the presence of cancer. Certain chemical tests of stomach contents are sometimes of value. In late stages a lump may often be felt through the body wall.

50. Are all hospitals equipped to diagnose and treat all kinds of cancer?

No. To be adequately equipped for this purpose a hospital must have an operating room; a laboratory for the microscopic diagnosis of tissue; X-ray equipment suitable for diagnosis and for treatment; and must own or have access to a sufficient quantity of radium. To make this equipment effective there must be physicians adequately trained in its use.

51. Is cancer more frequent among negroes than among whites?

Proportionately fewer cancer deaths are reported among negroes than among whites, but this perhaps is due to poor reporting of the disease.

5. HOW TO TREAT IT

52. How should cancer be treated?

By surgery, X-ray, or radium, or a combination of the three in the earliest possible stage of the disease.

53. Are X-ray treatments good for all kinds of cancer?

No. Treatment depends on type and location of the growth. Some cancers will not respond to X-ray or radium treatment but must be treated by surgery or other means, as certain hormones or isotopes.

54. What is the difference in the action of X-rays and radium on cancer tissue?

There is no essential difference. When properly used both will destroy cancer cells without seriously injuring the normal cells with which they come in contact.

55. How is radium used?

Radium in hollow needles is inserted into the cancerous growth or in the tissue surrounding it, or both, and removed after treatment is concluded.

Radium in a suitable container may be placed in contact with the growth, as in cancer of the skin. In larger quantities it may be used at a distance from the body, the rays passing through an opening in the container into the cancerous growth. The emanating gas of radium, known as radon, in suitable containers may be used in the same manner as the radium salt from which it is obtained.

56. Why is radium so expensive to use?

No less than 5.9 tons of a mineral which is half uranium must be processed to extract a single gram of radium. To extract a pound, 2,680 tons of such a mineral would be required. As minerals containing radium are not often this rich, in actual practice a yield of 1 gram of radium in 10 tons of ore is considered very good, and even minerals which yield only 1 gram in 200 tons are processed. It is, therefore, not surprising that the price of radium is about $20,000 per gram.

57. Do surgical or radiation treatments spread cancer?

No. On the contrary, such treatments tend to limit the spread of cancer.

58. Can the spread of cancer be stopped or retarded temporarily?

At times it can. Certain cancerous growths, hopeless from the standpoint of cure, may be controlled temporarily by proper treatment. Sooner or later, however, these growths may fail to respond to further treatment.

59. What should a person do who thinks he may have cancer?

Go to his physician at once for a thorough physical examination.

60. Is cancer curable only in the early stages?

Yes, in the large majority of cases. At times, however, cures have been obtained after the cancers have been present for a long time. The type of cancer always has an important bearing on its curability.

61. How long will an untreated cancer patient live?

This will differ with each individual and with the location and type of cancer.

62. Is it ever possible to state that a cancer has been completely cured? If so, how much time must pass before the cure is recognized?

After a cancer patient has been treated and has remained free of recurrence of disease for a period of 5 years, the chances for reappearance of the tumor are extremely small. (In a few rare instances cancer has recurred 8, 10 or 20 years later, so that a semiannual physical examination is a must for these patients.)

63. If you have been cured of cancer, can you develop another cancer? In the same place? In some other part of the body?

Yes. Regardless of a patient's past medical history, including the treatment of a previous cancer, he should be examined at regular intervals. Because of the tendency for cancer to reappear at the place of a previously existing growth or nearby, a patient should have a regular follow-up at least every 6 months. A new cancer may appear at the same place or in another part of the body.

64. Is there any known serum cure for cancer?

No. A serum is of value only against a disease due to a germ. Cancer is not caused by a germ; therefore, serums are of no value in its treatment.

65. Is it ever safe to rely on salves or medicine to cure cancer?

No. No paste nor salve will penetrate the tissues far enough to destroy deep-seated cancer cells; neither is there any medicine that will destroy cancer cells without also injuring normal cells with which it comes in contact.

66. Is there any chemical that destroys cancerous tissue?

There is some evidence that a few chemical substances such as the nitrogen mustards (chemicals related to the poisonous mustard gas) partially destroy cancerous tissues in some forms of cancer and leukemia. These chemicals are not cures but may alleviate suffering and may prolong life.

67. Will ultraviolet or infrared rays kill cancer cells?

No. These agents have no curative effect on cancer cells even at high intensity over long periods of time.

68. Will hormones cure cancer?

This problem is still under investigation. There is a great deal of evidence to indicate that treatment by certain hormones may prolong life, and alleviate pain and suffering in certain breast cancers in the female and prostate cancers in the male. It is too early to state whether these hormones will cure cancer.

69. Will isotopes cure cancer?

So far, isotopes have proved of limited value in the treatment of cancer. However, a small percentage of thyroid cancers respond remarkably well to radioactive iodine and certain cancers of the blood and blood-forming organs are quite favorably affected by radioactive phosphorous.

70. Are the results of cancer studies on animals applicable to human beings?

Experiments with animals are essential to test many theories concerning cancer. The nature of cancer in animals and man is so similar that principles discovered in one will undoubtedly prove to be of value in understanding the problem in the other. However, animal experiments always require careful checking to prove their relevance to cancer in human beings.

71. What is the latest and most successful of the recently reported cancer treatments?

While many cures are constantly being evaluated by many laboratories over the country, surgery, X-ray treatments, and radium remain the chief weapons of the physicians' fight to cure cancer. Certain hormones and isotopes offer some promise of assistance in their fight but it is much too early to call these in any form cures.

72. Is any real progress being made in cancer research? Along what lines?

Real progress is being made in cancer research which has thrown much new light on the normal and abnormal growth processes. However, the goal of finding the cause of cancer and thus its prevention is still in the future. Avenues of investigation have recently opened up on all sides: in chemistry by a study of the hormones and the complex role they play; in physics by application of radioactive materials and the development of X-rays at higher voltages; in surgery by more radical excision of tumors; and in the studies of enzymes, genetics, nutrition, cytochemistry, etc. Scientific disciplines of all types have been brought to the front in an all-out attack.

6. CANCER IN MEN

73. Are cancers in men and women different?

There are no fundamental differences in cancers appearing in men and women.

74. What forms of cancer are more common among men than women?

Cancer of the buccal cavity, pharynx, esophagus, stomach, rectum, larynx, bronchus, lung, kidney, bladder, skin, and brain are all more common in men than in women. Men alone, of course, have cancer of the prostate and male genital organs.

75. Does smoking cause cancer?

The relation of smoking to cancer of the mouth and lungs is uncertain. Therefore, it is best to play it safe and, if you smoke, to use tobacco in moderation.

76. Can cancer result from sexual intercourse?

No. There is no known relation between cancer and sexual activity on the part of the male or female.

77. Is cancer of the prostate common? At what age does it generally occur?

Yes; cancer of the prostate is one of the most common forms of cancer in older men. Men should be on guard against this form of cancer especially as they approach 60. A thorough physical examination, including a rectal examination, is the only way to discover this hidden cancer early enough for cure.

7. CANCER IN WOMEN

78. Do more women than men die of cancer?

Almost as many men die of cancer every year as women. In the United States, 88,801 men as compared with 93,204 women died of cancer in 1946. Three factors combine to account for this difference: (1) There are a few more women than men in the population; (2) the female population is somewhat older on the average than the male population; and (3) the incidence of cancer is higher among females than males due primarily to the high incidence of cancer of the breast and female generative organs.

79. Does cancer occur more frequently among married or unmarried women?

Reports from death certificates show that above the age of 40, the cancer death rate is higher among single women than among married women of the same ages. Single women have higher death rates from cancer of the breast and married women have more cancer of the uterus. Many physicians believe that nursing a child reduces the chances of cancer of the breast and that injury at childbirth increases the risk of cancer of the uterus if proper medical attention is not received.

80. Is there danger in watching a lump in the breast to "see what happens"?

Yes; a very grave danger. Time is the most important factor in the control of cancer and waiting to "see what happens" may permit a curable cancer to become incurable by spreading to other tissues.

81. Are all breast lumps cancerous?

Not more than a small percentage are cancer. Only by a careful pathological examination of the removed lump can it be definitely determined if it is cancer.

82. What precautions should be taken to avoid cancer of the breast?

Do not wear garments that press the breast tissue tightly against the chest wall. Every woman should have her breasts examined semiannually by a physician. She should request her physician to instruct her in the proper technique for examining her own breasts in the erect and reclining positions and should examine her breasts once a month shortly after her period.

83. What precautions should be taken to avoid cancer of the uterus (womb)?

Have all birth injuries repaired within 6 months after they occur. Have all unnatural vaginal discharges investigated. Up to the age of 35 have an annual examination; thereafter a semiannual one. Bleeding after the change of life calls for a physician's examination at once.

84. Do uterine fibroids ever become cancerous?

Fibroid tumors only rarely undergo malignant change.

8. CANCER IN CHILDREN

85. Can cancer develop in children? At what age?

No age is free from cancer. Certain forms of cancer are most often found in young children.

86. If a parent dies of cancer, are the children more likely to have the disease?

Practically, no. In many families where a parent has had cancer, the disease has not appeared in the children. Again, a person in whose family there is no record of cancer may develop it.

87. Once it has gotten a start, does cancer develop more quickly in children than in older people?

Probably not. The rate of growth at any age depends upon the type of cancer.

88. If detected in time, can cancer in a child be cured more quickly than in an adult?

The cure of cancer has little relation to age. It depends upon the extent of its growth at the time it is detected, and the adequacy of the treatment as well as the type of cancer.

9. CANCER'S VITAL STATISTICS

89. Is cancer increasing?

The number of annual cancer deaths in the United States has increased from 41,000 in 1900 to 189,811 in 1947. The major reason is the growing number of

older people in the population coupled with the fact that the cancer death rate (the number of deaths per 100,000 of the population) rises very rapidly with age. Improved diagnosis and better reporting of deaths are other factors that help explain the increase. The cancer death rate has increased from 64 per 100,000 in 1900 to 132.4 per 100,000 in 1947, partly due to the aging of the population. Cancer death rates within specific age groups in men have tended to rise, but in recent years some of the rates for females within certain age groups have decreased.

90. How does cancer compare with other diseases as a cause of death?

It occupies second place, as seen from the following table of deaths from leading causes in the United States in 1947:

Heart disease	460,580
Cancer	189,811
Cerebral hemorrhage	131,039
Nephritis	80,288
Pneumonia and influenza	61,836
Tuberculosis	48,064

91. At what age do cancer deaths occur most frequently?

The age distribution of cancer deaths in the United States in 1946 is shown herewith:

Age	Males	Females	Total
Under 5	353	294	647
5 to 14	391	326	717
15 to 24	749	536	1,285
25 to 34	1,373	2,381	3,754
35 to 44	3,775	7,988	11,763
45 to 54	11,993	16,463	28,456
55 to 64	23,128	22,466	45,594
65 to 74	27,026	23,894	50,920
75 and over	20,013	18,856	38,869
Total	88,801	93,204	182,005

92. How can cancer deaths be reduced?

By four means: (1) Early diagnosis, the responsibility of the patient in having himself regularly checked by his physician and the responsibility of the physician in recognizing the possibility of cancer and prompt referral for further diagnostic procedures and proper treatment; (2) adequate and prompt treatment, the responsibility of the physician who treats his patient for cancer; (3) discoveries of newer and more effective means of treatment; and (4) the ultimate discovery of the cause of cancer. These last two must come from the research laboratories and the clinical investigator.

From these stem the basic principles of the cancer control program of education, research, and service of the American Cancer Society, the health agencies of the Federal and State governments and private philanthropies.

10. CANCER AND YOU

93. Is there any disgrace in having cancer?

No. There is no more disgrace in having cancer than in having a broken arm.

94. How can I go about locating the cancer-detection center nearest my home?

By inquiring from your family physician, the local unit of the American Cancer Society, or from your city or county health department.

95. Where can I get the names of specialists qualified to treat particular kinds of cancer?

Your family doctor may refer you to a cancer clinic at your local hospital or to a specific physician with the best experience in treating your type of case. The local unit of the American Cancer Society will be glad to be of service.

96. Can I get proper cancer treatment in my small local hospital or must I go to a large city?

This depends entirely upon the type of cancer you have, the adequacy of facilities for treatment in your area, and the experience of the physicians there. Each patient is a separate problem and must be treated individually.

97. How can I find the nearest hospital equipped to diagnose and treat cancer?

Your family doctor, your local unit of the American Cancer Society, your county medical society, or your county or city health department will be glad to refer you.

98. Can a physician examine a patient thoroughly for cancer in his office or is it necessary to go to a hospital?

An office examination should be sufficient unless, by questioning or from his findings in his office, your doctor feels you should go to the hospital for a more complete examination, such as by X-ray and blood tests.

99. Does cancer usually cost more to cure than other diseases?

It often does. Here, again, it depends upon the type of cancer you have and how much must be done to treat it.

100. Why are quacks dangerous?

For the following reasons, among others:

1. Few quacks are medically trained; therefore, they have no fundamental knowledge about cancer.
2. They cause the patient to lose valuable time that should be used in getting proper treatment.
3. The pastes and "medicines" used by quacks have no value in curing cancer.
4. The quack takes the patient's money under false pretenses thus depriving him of means for obtaining competent treatment elsewhere.

101. How can I tell a quack from a reputable physician?

If a person advertises a cure, guarantees a cure, or employs a method of diagnosis or treatment not generally accepted or endorsed by the medical profession, he may be classed as a quack. No reputable, ethical physician will do any of these things.

THE BEST DEFENSE AGAINST CANCER

The best defense against cancer lies in everyone having periodic thorough physical examinations. Women over 35 should be examined twice a year. Other people should be examined at least once a year. In addition, for protection between examinations, everyone should know the seven danger signals which may mean cancer and go at once to a doctor upon the first appearance of any one of them.

The seven danger signals of cancer are:

1. Any sore that does not heal.
2. A lump or thickening, in the breast or elsewhere.
3. Unusual bleeding or discharge.
4. Any change in a wart or mole.
5. Persistent indigestion or difficulty in swallowing.
6. Persistent hoarseness or cough.
7. Any change in normal bowel habits.

For further information consult your doctor, your city or county health department, or your local or State office of the American Cancer Society.

(Thereupon, at 5 p. m., the committee adourned to meet again at 10 a. m., Saturday, October 3, 1953.)

HEALTH INQUIRY

(Cancer)

SATURDAY, OCTOBER 3, 1953

HOUSE OF REPRESENTATIVES,
COMMITTEE ON INTERSTATE AND FOREIGN COMMERCE,
Washington, D. C.

The committee met pursuant to adjournment at 10 a. m. in the committee room of the House Committee on Interstate and Foreign Commerce, Hon. Charles A. Wolverton (chairman) presiding.

The CHAIRMAN. The committee will come to order.

In order to conserve time, I will make my opening statement pending the arrival of other members of the committee.

No American can fail to be aware of the tremendous importance of atomic energy in our daily lives. We know atomic energy principally as a weapon of mass destruction, developed and used during World War II and continuously extended and perfected since that time, in order that we may be able to defend ourselves against attack by those world forces which seek to destroy our way of life. We know that the enemy is engaging us in a race of atomic weapons—and while we pray God that the time will never come when these weapons will again be turned against mankind, as Americans we believe that free nations will never permit tyranny to rule, with coercion of groups and subjugation of the individual replacing the rights of free men.

It is in the American tradition that the very knowledge needed to create these deadly weapons is applied in equal measure to peaceful pursuits—to industrial uses, to agriculture, and to health and medicine.

This committee is now engaged in a broad study of health. We have undertaken this inquiry not only because the committee has legislative responsibilities in this field, but also because we feel it is important to inform the American public of certain basic facts relating to the important diseases of today—what progress has been made, the magnitude of the disease problems today, and what hope there is for the future, what can be done to speed up the prevention and control of these diseases which exact such a tremendous toll in human suffering and in economic loss.

Yesterday, we heard some splendid testimony by scientists and interested laymen on the general subject of cancer. We were informed, among other things, that radiation can be both a cause of and a cure for cancer. One cannot think of radiation or of atomic energy without talking almost in the same breath of the Atomic Energy Commission. This committee was particularly proud and pleased that the Atomic Energy Commission agreed enthusiastically

to participation in these hearings and has sent us today some of its most distinguished representatives to discuss the medical and biological effects of radiant energy.

The Atomic Energy Commission, as is well known, has the huge responsibility of controlling atomic energy for the welfare of man. At the same time, it has the obligation to explore its nature, its implications, and its applications.

The members of this committee are very pleased to have your testimony, gentlemen. The pattern that has been established for these hearings is one of extreme informality. We hope you will feel free to discuss all the ways in which atomic energy relates to health, whether or not it has to do specifically with cancer. The other groups that have been before us have nominated a discussion leader and have conducted, in effect, an informal symposium, based on a prepared agenda. I understand that Dr. John C. Bugher is prepared to act as discussion leader for this group. It would be appreciated, Dr. Bugher, if you would identify yourself for the record, and if your colleagues would do the same, in order that the reporter may be able to identify each speaker.

Dr. BUGHER. Thank you, Mr. Chairman. I believe the reporter has had the names of the participants.

The CHAIRMAN. Would you be kind enough to speak just a little louder, please?

Dr. BUGHER. Yes, sir.

The CHAIRMAN. I would suggest that after you have finished giving your background and your official position, and so forth, that you call on each one of the members of your group who are here today and have them rise and give their background and position, or you may do it, according to the way you think it would be better.

STATEMENT OF DR. JOHN C. BUGHER, DIRECTOR, DIVISION OF BIOLOGY AND MEDICINE, ATOMIC ENERGY COMMISSION, WASHINGTON, D. C.

Dr. BUGHER. May I present myself, then, as presently Director of the Division of Biology and Medicine of the Atomic Energy Commission and formerly with the Rockefeller Foundation in New York City.

On my left is Dr. Charles L. Dunham, who is Chief of the Medical Branch of this Division and in charge of all its medical activities.

Next to Dr. Dunham is Dr. Robert Hasterlik, of the Argonne Cancer Research Hospital in Chicago, affiliated with the University of Chicago. Next to him is Dr. Shields Warren, the first Director of the Division of Biology and Medicine of the Atomic Energy Commission, its organizer and the leading spirit in the medical application of atomic energy in this work, who has now returned to his regular post as professor of pathology at Harvard Medical School and pathologist to the Deaconness Hospital in Boston. Next to him is Dr. Marshall Brucer, director of the Oak Ridge Cancer Hospital, pertaining to the Oak Ridge Institute of Nuclear Studies. And, finally, Dr. John T. Godwin, pathologist for the medical department of the Brookhaven National Laboratory on Long Island.

The CHAIRMAN. We express to you, Dr. Bugher, and your associates who are here this morning our very great appreciation for your

willingness to come to the committee and give of your knowledge as the result of your study and experience in matters which have held your attention and activity. We appreciate that it means some inconvenience for you to be here, and for that reason we appreciate it all the more your appearance here today among us.

Now, Dr. Bugher, you may proceed in whatever way you desire to develop the information that it is your purpose to bring to the attention of the committee; and when each one has fininshed his statement, we would appreciate the opportunity of members of the committee, if they so desire, to ask questions.

We also want the members of the panel who are here today to feel free to ask questions of each other if they wish to do so for the purpose of clarification or emphasis, so that we will be able to get the greatest possible amount of worthwhile information as the result of having you here together this morning.

You may proceed, Dr. Bugher.

Dr. BUGHER. Thank you, Mr. Chairman. On behalf of Chairman Strauss of the Atomic Energy Commission and the other members of the Commission, I wish to express their appreciation of the invitation of this committee to present the atomic-energy program in cancer.

On behalf of myself and my colleagues, we are honored at being allowed to appear before you and very deeply appreciate the privilege which we have been given.

In the testimony of yesterday the magnitude and complexity of the cancer problem was very effectively brought out. The general subdivisions of the broad attack on the disease and the manner in which the various resources of the country are being brought to bear have been outlined by various organizations and agencies that are so deeply concerned.

It is possible, therefore, to be very brief in stating the mission of the Atomic Energy Commission with respect to its responsibilities in this field. The great reasons are twofold: First, cancer is one of the specific industrial hazards of the atomic age and second, the unique reactors, the accelerators, and the radioactive substances, which are the result of the Atomic Energy Commission's activities, hold great promise for useful applications to medicine generally and to the treatment of cancer in particular.

So, we envision two primary responsibilities and concerns: One, with radioactive materials as causative agents of cancer and the other with the application of new sources of radioactivity to the treatment of cancer. There is a twofold approach therefore to this problem. The approach of the Division of Biology and Medicine of the Atomic Energy Commission is one devoted entirely to research in these two broad aspects of the cancer problem. It is not the objective of the Division to operate programs in the control of cancer nor to conduct mass treatment of the disease. These functions pertain to other agencies and organizations which have appeared before you. Our purposes are to increase the understanding and knowledge of the causation of cancer and to develop new and hitherto unknown applications of nuclear energy and to make them generally available for cancer therapy. Cancer research, therefore, constitutes about 10 percent of our entire research activity in biology and medicine.

I think it is pertinent to add here that this general medical program of the Atomic Energy Commission is applicable both in peace and

war. Its greatest motivations are peacetime applications. The results of the research are almost entirely in the unclassified field. So that they are available generally to the medical profession and are published normally in the regular means of dissemination of knowledge with reference to medical sciences generally.

Now on the question relative to the causation of cancer, among the many extrinsic factors—that is the factors affecting the individual from without—in the causation of cancer we now recognize nuclear radiation as being among the most important. The occurrence of skin cancer in persons subjected to prolonged X-ray exposure has been known for many years. In fact, the very first persons working with X-ray became severely burned, and as you will recall, many of them subsequently developed skin cancer as the result.

At a later date it was further realized that astonishingly small amounts of radium deposited in the bones may give rise to highly malignant bone cancers after many years of such exposure. As our knowledge has advanced, we have come to appreciate that the time interval between the original injury and the ultimate appearance of cancer due to this injury may be very long and measured in years. Thus, we must give particular attention to all those activities within the atomic-energy program as the result of which individuals may be exposed to radioactive substances either through the inhalation of radioactive dusts or the ingestion of food and water containing these substances.

In effect, this means that we are concerned with all stages of the atomic-energy program from the initial mining of uranium ores to the remote effects resulting from the detonation of atomic weapons, as in the extensive studies of the Atomic Bomb Casualty Commission in Japan by the Atomic Bomb Casualty Commission operated by the National Academy of Sciences.

So, our concern begins with the problem of the miner in getting the ore from the ground, and it does not end until we have evaluated the long-term effects of exposure of radiation whether from bomb, reactors, or whatever type of origin such radiation may have. At many points our responsibilities overlap and merge with those of the United States Public Health Service, the State health departments and other agencies. You will find, therefore, that the Atomic Energy Commission, the United States Public Health Service and various State departments are actively pursuing cooperative studies in the possible hazards of inhalation of dust in uranium mines.

We are also conducting extensive research in the national laboratories and in many universities on the effects of inhalation and ingestion of fission products resulting from the operation of reactors or by the detonation of weapons. By fission products I refer to the atomic fragments which result from the fission of the uranium nucleus, so that resulting from that fission we have a great number of elements, most all of them for the time being at least are highly radioactive. So, that not only the original materials, but the results of the fission reaction itself, become highly important in this general area.

Furthermore, the dynamic drive of physical research into the nature of the world about us and in the structure of the atomic nucleus itself has resulted in the production of elements unknown in the natural world. Some of these, such as plutonium, are being produced

in a large quantity. Being alpha emitting elements and thus similar to radium, they present profound problems in the protection of health. By the expression alpha emitting I am referring to the spontaneous emission of charged particles which are actually nuclei of the helium atom, and all of the elements being concerned having the capability of carrying large amounts of energy a short distance. The distances are very short and are measured in one-thousandth of an inch, but all of these elements, such as plutonium, radium, and so on, have this property of spontaneous radioactivity. The production of alpha particles may be very important when taken internally, and we have a lot of these new elements which we can mention including not only plutonium, but such things as americium and curium, elements which do not exist in nature and which have been entirely manmade. The number is constantly growing and each one presents unique problems of toxicity as well as various aspects which are quite new to our sciences.

So much for the general introduction of the program dealing with the causation of cancer. The other side is the research in the treatment of cancer—the therapy of the disease, and as was mentioned in the beginning, the Atomic Energy Commission's program has made possible the existence of unique devices and substances whose applicabilities in the treatment of cancer must be explored. Some of these applications have great promise, but with a disease of such complexity as cancer—which is actually a host of many diseases—we cannot expect a simple answer to the problem of treatment but, rather, the development of many methods, each with special virtues in particular situations. The clinician needs many and highly diverse tools at his disposal if the whole capabilities of modern science are to be made fully effective in this field.

I think it has been made clear in the previous testimony here that there are various ways in which one may attack the problem of cancer in the cancer patient, each way having the objective of destruction of the cancer cell. We do not see any one way in which that may be accomplished, but rather a variety of ways, and the more varied the resources of the physician in the treatment of his patient, the more effective should be the result.

These therapeutic resources in the atomic-energy field have in common the production of nuclear radiations which may consist of the electromagnetic gamma radiation similar to the X-ray, or of the charged nuclear particles such as the alpha particle which I mentioned, or the beta particles which are actually electrons and uncharged particles which are called neutrons. In other words, there are several different kinds of radiation which may be emitted from a single atomic nucleus.

There exist for the future the possible application of other nuclear elements such as mesons, but we know very little of such forms of radiation as yet, and we will have nothing more to say of such nuclear particles at the present time.

These radiations may be emitted or produced in various ways. The reactor or the atomic pile is the chief source of neutrons at the present time, the neutron being the uncharged nuclear particles. Likewise, the reactor is the means of producing the radioactive isotopes, of which we hear much in the cancer field today. Then, too, radiations of medical value may be produced by accelerators such as the cyclotron, the

betatron, or the various forms of linear accelerater which are appearing in increasing numbers. These are electromagnetic devices in which particles are accelerated in a succession of boosts to very high energy and radiation is achieved analogous to those which may be obtained from radium and other elements at will.

Most of the cancer research dealing with therapy supported by the Atomic Energy Commission is carried on in research hospitals, each placing special emphasis upon one of the modes of producing effective radiation. Four such major centers or hospitals are in existence. There is one each at Brookhaven, Oak Ridge, Chicago, and San Francisco, in the radiology laboratory of the University of California Medical School at San Francisco.

At Brookhaven the research emphasizes the use of neutrons from the reactor there. The Oak Ridge Cancer Hospital is the chief center for the utilization of isotopes, either internally or externally in powerful radiation sources; the new Argonne Cancer Research Hospital at Chicago enjoys access not only to reactors but to accelerators in several different forms, while the radiological laboratory at San Francisco is exploring the utility of the 70 million electron volt synchrotron. Each of these hospitals, I think it is important to realize, is affiliated with the regional medical schools and works closely with the medical schools.

The number may vary from 9 universities affiliated with the Brookhaven laboratory to about 27 affiliated with the Oak Ridge group.

To lay before you in a more comprehensive manner the programs of these various centers we have requested that representatives join us here in order that they may explain directly to you the nature of the operations and the nature of the research they are carrying on.

Dr. Robert Stone, who directs the program at San Francisco, which I mentioned, cannot be with us, and for a discussion of the progress of this research center, as well as the broad outline of the activities of the medical branch, I wish now to turn the discussion to Dr. Dunham, on my left, who is the Chief of the Medical Branch, and will also speak for the San Francisco program.

The CHAIRMAN. Before we start the hearing of Dr. Dunham's statement, I was aware, as I am sure every layman in this audience is, of the use of very technical terms and names that certainly I have never been acquainted with in any of my activities, and I assume that it would be rather difficult for the reporter to get down those names as accurately as we would like, and as we would wish to have in the record. I also am of the opinion that the reporters of our newspapers who are present would likewise have some difficulty in doing it.

I noticed while you were giving your statement that you referred occasionally to notes or some prepared statement that you had before you. If there is any additional copy of that, I would be pleased if the reporter could have it so as to make certain that he has it just as you wish it to be in the record. If there are additional copies, I would be glad to have the use of one of them for the benefit of the newspaper reporters who are present, to select any material from that they might feel would be important to make reference to.

Do you have any extra copies?

Dr. BUGHER. At the moment I do not have an extra copy here but we will produce them.

The CHAIRMAN. I will tell you what I would suggest if you will let us have that copy for use by our reporter and in the meantime make it available to our newspaper friends who are present so that they could select from it any part they might wish, assuming that there are parts they would make reference to, then I will have copies of that made for them by our stenographic staff so as to be of some assistance to you, and I leave that entirely to them. If you will deliver what copies you do have, it will be helpful to us.

Mr. CARLYLE. Mr. Roberts has just informed me that the reporter happens to be from Alabama and he would not need this extra information.

The CHAIRMAN. I am just informed by Mr. Roberts, a member of this committee from Alabama, that the reporter who is taking down this testimony comes from Alabama, and that being the case he would need no extra help other than the oral presentation.

Of course we are all familiar with the brilliance of these folks that come to us from Alabama, including our colleague on this committee, and if he had made me aware of that fact, maybe I would not have had to extend this solicitude to the reporter.

I think that Mr. Dolliver would like to ask a question, if he may.

Mr. DOLLIVER. As I understood your testimony, the atomic radiations are not only a cause, but also a cure for cancer.

Dr. BUGHER. You are quite right. The effects of radiation are within the cell, and the effects may be profound so that a cell which has been subjected to radiation and not killed may be made abnormal in various ways, particularly where there has been continuous radiation.

Particularly where there has been continuous radiation over a long period of time, the cell may not be killed but may be made so abnormal that it becomes incapable of sustained growth, which is really cancer. So, we think particularly in this respect of radiation applied to sensitive tissue over a long period of time as an example of the sort of thing that we have in mind. We cite the cases of radium poisoning where radium is deposited in the bone and continues to give off its various radiations, and in the course of years the bone may develop a tumor which may destroy the individual. The time lags may be on the order of 10 or 15 years from the time the radium is first taken into the body until a difficulty such as this appears.

That is an example of the one type of thing by the same energy that can partly injure a cell and then also if applied in sufficient intensity kill it. The objective of tumor therapy is to kill the cancer by one way or another. Consequently radiation may also be used as a means of destroying the cancer and that usually involves application of radiation at high intensity for a short period of time, whereas the cancer-producing tendency is manifested only over a long period of time.

Mr. DOLLIVER. The resulting thought that comes to me is that whether you give cancer or whether you cure it, depends upon the intensity of the application of these radioactive materials?

Dr. BUGHER. Yes; that is correct. In the case of radium there are some levels of poisoning below which we have not seen any cases of cancer resulting. In general, the more of the material which the individual has in his body, the greater the risk, and we attempt to determine a level below which the risk appears to be negligible and take

that level as a permissible limit. We all have small amounts of radium in our bodies as a part of our natural environment, but ordinarily that gives no difficulty.

Mr. DOLLIVER. I am greatly puzzled as to the relationship between X-rays and the X-rays that are gotten from a cyclotron or any one of those high-voltage machines; that is, the relationship between the rays that come out of radium which we have known for a generation or more and the rays that come from the various elements you have mentioned—new elements such as plutonium and others that have been discovered by atomic-energy research.

Is there any elaboration of those relationships which would be understandable by laymen?

Dr. BUGHER. No, sir; I am sure it is not beyond the scope of understanding. It is rational but not altogether simple.

If I may explain here—the forms of radiation which may be given off by a radioactive element may differ considerably. Now, one of them, for instance, is the gamma radiation which, as I mentioned, is similar to X-ray that is transmitted in the same manner that light is transmitted with the same speed, and the only difference beween gamma radiation and our ordinary X-ray is that gamma radiation is produced by an atomic nucleus, whereas X-ray is produced by bombardment of a target in a special tube. Usually the gamma radiation is a relatively high energy, where the ordinary X-ray is comparatively low, but that distinction does not always hold true.

Then, in addition to that type of radiation which is transmitted with the speed of light and behaves in many ways as does light, then we have particular forms of energy that are shot off from the nucleus. Some of those are very large and some are very small. The large one which I mentioned as the alpha particle is actually a core or the nucleus of the helium atom.

Mr. DOLLIVER. Now, when you say "large" you mean large enough to be seen under a microscope?

Dr. BUGHER. No.

Mr. DOLLIVER. Large relative to other things?

Dr. BUGHER. We are talking about entirely submicroscopic and atomic things. The dimensions are then very minute fractions of millionths of an inch. The alpha particle is really itself an atomic nucleus. The beta particle, which I mentioned, is very, very much smaller, and is an electron which is traveling at high velocity. It is a small, extremely minute charge on a very minute particle of matter; almost weightless, if we want to put it that way.

Then the neutron, which I mentioned, is one of the constituents of the atomic nucleus that does not have any charge. It is very difficult ordinarily to detect. But none the less it is readily absorbed by other atomic nuclei with the production of new elements, actually.

All of these radiations differ enormously in their range. The gamma radiation may be projected actually for a mile or more. The neutron may itself, depending on its energy, travel considerable distances and penetrate surprisingly dense material.

As an example of that, at Nevada when we wish to do a neutron experiment, protecting the experimental material from the heat and all of that, we put these experimental devices, materials, and animals inside of lead chambers thick enough to stop the gamma radiation, but the neutrons will come through as much as 7 inches of lead without

being very much reduced. So that there is marked difference in range.

Mr. DOLLIVER. Right at that point, by the word "neutron" do you mean it is neutral, has no effect?

Dr. BUGHER. Has no charge; that is right.

Mr. DOLLIVER. Has none of the effects attributable to gamma and alpha and beta rays?

Dr. BUGHER. All of these radiations have certain things in common. They all produce ionization. That is to say, they cause disintegration of the molecules of tissue and of water with the production of charged molecules, so we call them ionizing radiations.

Although the physical properties of the radiations differ very markedly, their biological results are essentially similar, so we tend to group them all together here.

Mr. DOLLIVER. I am afraid I interrupted your train of thought there, Doctor.

Dr. BUGHER. No, sir; that was a very helpful question.

Mr. DOLLIVER. Now, to go a little further afield than that, we are all of us familiar with certain natural oscillations and waves. The sound waves, we know, for example, are oscillations of "circumambient air" as Mr. Shakespeare once said. We know about the radiation of light which we enjoy with sight. Then there are what we call radio radiations and in the radio range there are many variations of speed and wavelength.

Is there among scientists a grouping of all these various radiations that are natural phenomena, or do they separate them out into their various fields and consider them totally unrelated?

Dr. BUGHER. In ordinary discussions I think one tends to speak of them as though they were unrelated, but in fact one can regard electromagnetic radiations such as light and radio waves as a continuous system or a continuous gradation of change of wavelength from the very long radio waves, which may be measured in hundreds of yards in wavelength, through visible light, which is only a very small portion of this spectrum where the dimensions of the waves are minute fractions of a millimeter, measured in millionths of a millimeter, actually, all through the ultravioet range which is not visible but still shorter in wavelength, to the X-ray, which is still shorter, and finally to these high-energy gamma radiations where the wavelength is very short, indeed.

Mr. DOLLIVER. There is a progression, then, from the visible light and below the visible light in the infrared rays on clear up to the radiation received from radioactive materials?

Dr. BUGHER. Yes, sir; that is true.

Mr. DOLLIVER. Does radium come into that spectrum somewhere?

Dr. BUGHER. Radium gives off three different kinds of radiation from the same atom. The gamma radiation comes off, which I mentioned. From time to time the radium atom extrudes, shoots off, alpha particles, which are the heavy helium nuclei of which I spoke. And also from time to time the atom emits beta particles. So that from the spontaneous radioactivity of radium three different types of radiation result.

Mr. DOLLIVER. But they are in the spectrum you referred to?

Dr. BUGHER. The gamma radiation is in the spectrum; yes.

Mr. DOLLIVER. Now you said something about the care or solicitude which your division of the Atomic Energy Commission, the Division of Biology and Medicine, has with respect to the handling of atomic materials from the very time it is mined until it is finally disposed of. There are mineral resources from which fissionable materials are obtained, which are scattered over the earth pretty generally; is that right?

Dr. BUGHER. Yes, sir.

Mr. DOLLIVER. Does that material in its natural state have the same results with respect to the production of cancerous tissue, as it would in the refined state?

Dr. BUGHER. We are speaking really of uranium.

Mr. DOLLIVER. That is right.

Dr. BUGHER. And the materials here.

Mr. DOLLIVER. Yes.

Dr. BUGHER. The natural occurring uranium is radioactive partly due to the fact that it breaks down within itself to radium, so that the natural uranium therefore always carries a certain degree of radioactivity, which is very low. Naturally, if one concentrates the radium the material is more active than it was in the beginning, but pure uranium is not in itself very markedly radioactive. There is a spontaneous activity there, but most of the activity of natural uranium comes from the contained radium.

Mr. DOLLIVER. In other words, in its natural state it does not present a health hazard to any appreciable degree?

Dr. BUGHER. I think we do feel that it must be regarded to have a health hazard from two aspects. One is the contained radium which I mentioned; and the other is that uranium is itself a chemically toxic material entirely apart from the question of radiation. So that we do not like to see people acquiring any appreciable amount of uranium, even though the danger from radiation itself would not be very great. But the material is chemically toxic.

Mr. DOLLIVER. You mentioned the fact, too, that some of these materials, and I think you mentioned plutonium, did not occur naturally on the earth. Has science been able to determine whether it exists anywhere in the universe; that is, in the solar system or otherwise?

Dr. BUGHER. So far as I know I do not believe that the spectroscopic study of stars has disclosed any of these transuranic elements, the ones that are beyond our level of uranium. It may be that some of my associates would have more specific information on that, but I have never seen any note of the recognition of these elements in the stars.

Mr. DOLLIVER. What brought that question to my mind was the fact that helium was first discovered on the sun before it was found on the earth. Is that correct?

Dr. BUGHER. Yes. These special elements are all unstable, so that they tend to disintegrate spontaneously over a period of many years.

Mr. DOLLIVER. There may have been a time when they did exist for short periods, short intervals, and were transmuted into other forms, just as is done in your operations in refining uranium?

Dr. BUGHER. Yes, I should think so.

Mr. DOLLIVER. Thank you, Mr. Chairman.

The CHAIRMAN. Mr. Carlyle?

Mr. CARLYLE. Doctor, the investigation in which you and your associates are now engaged is really pioneer work; is it not?

Dr. BUGHER. Yes, sir.

Mr. CARLYLE. Is there any part of this particular study in which you are now engaged that has received any consideration at all prior to the atomic age?

Dr. BUGHER. Yes, indeed so. If we think back, radium itself has been available medically for many years now. Much of the knowledge of our problems of toxicity is really derived from this long experience with radium. But until the atomic period, you might say, did arise we had no other source of radiation except radium, X-ray tubes, and for a short period of time things produced by cyclotrons.

I am lumping those in with the atomic period, you might say.

Mr. CARLYLE. So then this particular study extends only over a very few years?

Dr. BUGHER. Yes, sir.

Mr. CARLYLE. Now, during that length of time do you feel encouraged as to the progress that is being made?

Dr. BUGHER. Yes; very much so. I think that as these other gentlemen will describe their programs one will see that in a comparatively few years we have made very substantial strides. The problem always is not to be so entranced with the progression and advancement of the present that we forget to realize that most of the road lies ahead nonetheless.

The CHAIRMAN. Any further questions, gentlemen?

Doctor, I would like to ask just one or two questions. In everyday practice X-rays are used for many purposes; examination of our teeth and throughout the body down to our feet, for that matter. Is it possible that too much of this X-ray may be of more damage than value?

Dr. BUGHER. It is quite possible. We do not think of radiation as being beneficial to normal tissue, and particularly if there are unnecessary exposures or prolonged exposures the effect may be very detrimental. Although it is not particularly within the province of this program, such applications as examination of feet for the fitting of shoes and things of that sort seem to be quite unnecessary exposure of parts of the body.

On the other hand, the X-ray examination of the chest, which usually means less exposure, actually, is a necessary diagnostic procedure. While the X-ray itself is not going to benefit the man's lungs, the knowledge which is derived from the examination by the roentgenologist is very valuable to him. I think all radiologists tend to be conservative in the application of radiation and to avoid any unnecessary exposure whenever possible.

The CHAIRMAN. Doctor, you mentioned the fact that the cancer effort of the Division of Biology and Medicine was about one-fourth, or a little over 10 percent of the Division's effort. What does that represent in dollars and cents?

Dr. BUGHER. This year the cancer research dealing with research and therapy amounts to approximately $3 million. And some other projects dealing with the causation of cancer will add a few hundred thousand to that. That is, the AEC contribution to this general effort is on the order of $3 million this year.

The CHAIRMAN. What is the total appropriation budget for your Division?

Dr. BUGHER. For this year it is approximately $26 million.

The CHAIRMAN. What is the total budget of the Atomic Energy Commission, if you happen to know?

Dr. BUGHER. It is well over $1 billion for this year, for operations.

The CHAIRMAN. Any further questions, gentlemen? If not, proceed with your panel in the way you wish.

Dr. BUGHER. Thank you. I will call on Dr. Dunham for the discussion of the program of the Medical Branch.

STATEMENT OF DR. CHARLES L. DUNHAM, CHIEF, MEDICAL BRANCH, DIVISION OF BIOLOGY AND MEDICINE, ATOMIC ENERGY COMMISSION

Dr. DUNHAM. As Dr. Bugher has just indicated to you, our cancer program stems from our active interest in cancer as an important hazard associated with the atomic-energy industry.

Now, cancer as a hazard in the atomic-energy industry is not entirely related to ionizing radiation as the cause of cancer. We also deal with toxic chemicals such as beryllium, which we are finding in experimental work can produce cancer; so it is not strictly limited to the radiation side of the picture.

As you know, over and above our main-line interest in the problem of cancer as an industrial hazard we in the Division of Biology and Medicine wish to apply for the welfare of the country, atomic-energy tools available to us in any way possible.

As you will recall, the Congress, in appropriating the first moneys for the Atomic Energy Commission, saw fit to see that we did not forget cancer, and actually put wording into the appropriation directing us to exploit in any way possible our abilities in the cancer field.

As Dr. Bugher has said, our activities are limited to research. We have no cancer-control program. We have no special programs of cancer education. We do have a rather sharply defined and limited grant-in-aid type of research contract program with the medical schools aimed at promoting unique and novel applications of atomic-energy products to the study and to the treatment of cancer over and above the activities which we have in our national laboratories, which you will hear about from the doctors here.

As you know, the National Cancer Institute and the American Cancer Society and other agencies have extensive programs of grants for cancer research as such. We have not set up a parallel program of grants simply because isotopes or radiation may be used in a research project. We believe our best competence lies in our ability to pick out, foster, and promote pioneering techniques with these new tools. Thus, in addition to our "on site" cancer-research programs which you will soon hear about, we have several rather interesting programs, four of which I would like to mention to you.

One we have carried on for many years at the Meharry Medical School. A group there has been doing pioneer work with radiogold and radiosilver, particularly the use of these isotopes as injected into the tumor tissue itself.

Also at Washington University in St. Louis we have supported the pioneer work in the use of radiogold in treating cancer of the womb.

And at Ohio State University we have supported for several years the use of radiocobalt, the same type of material that is used in the cobalt treatment bombs of teletherapy sources. They are working with it, developing it as a substitute for radium. It is cheaper. It is easier to handle, placing it in needles and threads and the like, available for the surgeons and therapists, particularly in treating cancer of the female genital organs.

More recently we have been sponsoring a program in Boston at the Massachusetts General Hospital, where they are using arsenic 74, a radioisotope which emits positrons, which are positive electrical charges as opposed to electrons, which are negative electrical charges. They are using this in the diagnosis of brain tumors.

This effort takes advantage of the so-called annihilation-of-matter reaction which is characteristic of the positron. We hope to continue to seek out and to give financial aid to such unique and novel approaches to the cancer problem.

When our advisory committee for biology and medicine had its first meetings back in 1948 and looked about to see what could be done immediately to help in the fight against cancer, they developed a program which has continued to the present day of making radioisotopes more or less freely available to workers in the cancer field. The users have, for the most part, had to pay only shipping charges, if the isotopes were to be used in cancer research, cancer diagnosis, and cancer treatment.

This contribution they are very proud of, and we hope to continue this program.

I believe Dr. Warren may touch on the use of isotopes in cancer research later in this morning's proceedings.

In addition to these activities specifically pointing toward cancer, we have in our main-line research activity a very extensive program which is comparable to the type of aid program which is given by the Public Health Service and the Cancer Society in medical research. Actually, because of the inseparability of working with cancer and working with ionizing radiation, we are supporting work in practically every cancer research center in the United States. It is not under the name of cancer research, because they are getting us fundamental information on the effects of ionizing radiation on tissues, as well as their cancerogenic properties. Thus we are supporting work at Dr. Rhoads' institution in New York to the extent of $250,000 a year. We are supporting an extensive program at the New England Deaconess Hospital in Boston. We have work under our auspices at the Lankenau Center in Philadelphia and at the Oklahoma Research Institute in Oklahoma City and at the Donner Laboratory for Cancer at the University of California at Berkeley, just to mention some of the more specific programs.

Our interest in the effects of radiation on tissues and its cancerogenic properties has been heightened recently by evidence that certain materials may enhance the cancerogenic effects of other substances. We are supporting a project at the Chicago Medical College in Chicago, where it has been shown that the radiations from radiostrontium—this is a beta radiation, electrons—if given to the skin of an animal in a quantity not sufficient to produce cancer, if later on that animal's skin is rubbed with something like croton oil, which has no carcinogenic properties whatsoever, so far as I know, it will

eventuate in cancer of that animal's skin. This is an important concept not only from our own interest in protecting our employees against the effects of radiation but in the whole problem of the cause of cancer, and suggests there are multiple causes in many, many cases, not just single causes. There may be additive effects of this sort.

Again, as pointed out, our interests overlap with those of others working in cancer. Therefore, we do support the Chemical Coodination Center of the National Research Council, referred to yesterday. Also, we actively support the Bioscience Information Exchange, which was mentioned yesterday, I believe, by Mr. Runyon.

Thus we meet in day-to-day activities our scientists, the scientists from the Cancer Institute, scientists being supported by funds from the Cancer Society and from the Damon Runyon Fund and the like.

Now, for our on-site program I have been asked to say a few words about the program in San Francisco. It is 1 of our 4 major AEC-constructed and owned but contractor-operated laboratories. We do not operate any of our research laboratories ourselves. They are all operated by contractors, most of the medical ones by university contractors. This one is the Radiological Laboratory at the University of California Medical Center in San Francisco, where we provided a 70 million electron volt synchrotron. That simply means a machine which will put out electrones with energies of about 70 million volts.

From this machine can be produced X-rays at the equivalent energy range, and also electrons can be brought out directly. This is the only machine at this energy range available to medical researchers in this country.

As you know, there is 1 at the Sloan-Kettering or Memorial Center of about 30 million electron volts.

There has been 1 at the University of Illinois of around 10 million electron volts. This is in a different order of magnitude.

If there is any virtue from radiation of this sort in the treatment of cancer we hope to find out in this program what these virtues might be.

Dr. Stone, who unfortunately cannot be here, is a pioneer in high energy radiations as applied to the treatment of cancer. He was the first person to use the high speed—the so-called fast neutrons—in the treatment of skin cancer, during the days of the Manhattan District. While he has been waiting for his machine to be installed—it is just beginning to operate—he has carried on a very extensive program in the use of radioiodine in the treatment of thyroid diseases—both benign, hyperthyroidism, and cancer of the thyroid. He and others have now contributed so much in the field of the use of radioiodine in disease that radioiodine now will probably be the first one of the artificially produced radioactive elements to be recognized and appear in the United States Pharmacopoeia.

I want to mention briefly, before closing my statement, the activities in Japan of the Atomic Bomb Casualty Commission, a followup study of the survivors of the atomic bomb at Hiroshima and Nagasaki. Dr. Farber yesterday referred to the increased incidence of leukemia among the survivors there.

This is the sort of activity that we feel pays off in the long run, even though for years some people have criticized this program because nothing turned up. Now we know that ionizing radiation from

an atomic bomb will have the same effect as X-rays if you get enough of them, produce an increased number of cases of leukemia. We must think about that.

The same thing, of course, in this activity has turned up the persons suffering from cataracts, among the survivors.

I think that is all I have to say right now, Mr. Chairman. Thank you.

The CHAIRMAN. Any questions, gentlemen?

Doctor, I would like to inquire this: Does your division furnish isotopes used in medical research without charge?

Dr. DUNHAM. Our branch, the Medical Branch, provides isotopes used in cancer research at 20 percent of the list price in the AEC catalog.

The CHAIRMAN. What is the English and Canadian practice in this respect?

Dr. DUNHAM. They make no distinction between an isotope used for cancer or for any other purpose.

The CHAIRMAN. Just one other question. The Meharry Medical School to which you made reference is located in Nashville?

Dr. DUNHAM. Yes.

The CHAIRMAN. That is a colored institution?

Dr. DUNHAM. That is right. Dr. Paul Hahn is in charge of that program that I referred to.

The CHAIRMAN. Mr. Dolliver?

Mr. DOLLIVER. These cyclotrons are machines of similar design and similar purpose which developed originally from the research of Dr. Lawrence; is that not true? Or was he the man who originated them?

Dr. DUNHAM. He invented the first cyclotron. There were also Van de Graaf accelerators which were developed before his. His particular type of device was way ahead of the others, at his time. He has continued, as you know, to be several jumps ahead in the development of the machine.

Mr. DOLLIVER. He is one of the leaders in this field; is he not?

Dr. DUNHAM. That is right.

Mr. DOLLIVER. What was the voltage or the electron voltage of his first machine, as you recall?

Dr. DUNHAM. Dr. Hasterlik believes it is about 8 Mev.—8 million electron volts.

Mr. DOLLIVER. Eight million electron volts. Now, the largest one is the one in San Francisco, with 70 million?

Dr. DUNHAM. No, the largest one of that type is the one at Berkeley.

Mr. DOLLIVER. Which is 100 million?

Dr. DUNHAM. There is one at the University of Chicago which is larger right now; 450 million electron volts.

Mr. DOLLIVER. Four hundred and fifty million electron volts?

Dr. DUNHAM. Yes.

Mr. DOLLIVER. Of course they have increased very rapidly in their size and capacity. Now, these are highly technical machines; are they not?

Dr. DUNHAM. Pardon me?

Mr. DOLLIVER. These machines are highly technical?

Dr. DUNHAM. Highly, and very difficult to operate. One machine was not mentioned. Dr. Bugher wanted us to be sure to mention the

cosmotron at Brookhaven, which gets up into the 2 billion and 3 billion electron volt range.

Mr. DOLLIVER. Does it not take a man of very considerable experience and skill to actually operate one of them?

Dr. DUNHAM. It takes more than one man. It takes a whole team to operate one of these newer, more high-powered ones.

Mr. DOLLIVER. The technique of their operation is not widely known or widely dispersed; is that right? I mean, you have to have trained personnel?

Dr. DUNHAM. Yes.

Mr. DOLLIVER. Unless you have trained personnel their operation can be most dangerous?

Dr. DUNHAM. Right.

Mr. DOLLIVER. And quite lethal if they are not properly operated. Would it not follow from that that there should not be so many of these machines until we learn how to operate them a little better?

Dr. DUNHAM. I think our record is pretty good so far. Of course, as you probably know, we have a fellowship training program to train people in radiological physics who can sort of police these machines and see that the longer haired scientists do not hurt themselves.

Mr. DOLLIVER. Did I not see one of these out here at the Bureau of Standards several years ago? I think they had one set up out there.

Dr. DUNHAM. They have a betatron and also one of the Van de Graaf machines.

Mr. DOLLIVER. Those two terms do not mean very much.

Dr. DUNHAM. The Van de Graaf is the one you may remember. It stood up very high with some big knobs up at the top.

Mr. DOLLIVER. Yes.

Dr. DUNHAM. The betatron, I guess, has been finished in the last year or two. That is where things go round and round and come out on the side.

Mr. CARLYLE. Mr. Chairman?

The CHAIRMAN. Mr. Carlyle.

Mr. CARLYLE. Doctor, I was just wondering how you arrived at the price of 20 percent when you sell isotopes.

Dr. DUNHAM. We were charging nothing. We found there was a little reluctance to separate out the use of isotopes on the orders. Therefore, we put this charge of 20 percent on so that there would be no confusion. It has reflected itself in the fact that, though the number of users has gone up under the cancer program, the actual numbers dispensed under cancer as opposed to those that were paid full price for has gone down. It really sort of clarified the atmosphere, as it were, from the standpoint of bookkeeping.

Mr. CARLYLE. Your statement a few minutes ago relating to cataracts was that an increase was found to exist after the bombs had been dropped in Japan?

Dr. DUNHAM. They found over 100 cases of what the scientists call cataracts among the survivors in Hiroshima. Only two of these are severe enough to require operation. They all developed some 4 to 5 years after exposure, but they seem to be very clearly of a type that is seen almost entirely in radiation exposures. There has been some experience with that type of cataract in this country.

Mr. CARLYLE. That is all.

Mr. ROBERTS. Mr. Chairman?

The CHAIRMAN. Mr. Roberts.

Mr. ROBERTS. Dr. Dunham, you mentioned the work of Dr. Van de Graaf, and I, of course, am very interested in that because he comes from my beloved State of Alabama. When did he begin his work in this connection; do you remember? What was about the time of his development?

Dr. WARREN. As I recall it, it was about 1933 or 1934 at the Massachusetts Institute of Technology.

Mr. ROBERTS. I knew that his work was done there. Thank you very much.

The CHAIRMAN. I do not wish to seem even a little bit critical in this. I am asking more from the standpoint of what might be a policy in the future. Having in mind that the assets of the Atomic Energy Commission amount to approximately $10 billion, having in mind that the Atomic Energy appropriation budget amounts to approximately $1 billion, and having further in mind the fact that the cancer budget of your Division is $3 million, I wonder if the charging for the isotopes is a significant thing and necessary or would it not be better to dispense them for research purposes without charge?

Dr. DUNHAM. You mean for all research purposes?

The CHAIRMAN. I would say for all, but, of course, we are interested particularly in this hearing in cancer.

Dr. DUNHAM. Yes.

The CHAIRMAN. As our direct interest.

Dr. DUNHAM. Dr. Warren, I think, would like to speak on that point as a user of isotopes.

The CHAIRMAN. We would be pleased to hear from you, Doctor.

STATEMENT OF DR. SHIELDS WARREN, DIRECTOR, CANCER RESEARCH INSTITUTE, NEW ENGLAND DEACONESS HOSPITAL, BOSTON, MASS.

Dr. WARREN. If I might, Mr. Chairman.

At our Cancer Research Institute at the New England Deaconess Hospital we use considerable quantities of isotopes. One of the peculiarities of isotopes is that they remain radioactive only certain lengths of time. Each radioactive element has its own time during which it remains radioactive. These are expressed in terms of half life, or the length of time that it takes for the activity to be reduced by one-half.

The materials used chiefly in research and in cancer treatment have relatively short half lives, and it is rather necessary to order only what one needs, rather than stocking up on a large amount of material and letting it spoil on the shelf, so to speak.

One of the problems is that if there is no charge made for things there tends to be less value placed on them, and sometimes they are ordered more freely than they are actually needed. And as a user I have found it rather helpful to have this nominal charge, which represents only a few dollars on each shipment, in order to remind me that these are valuable materials, that they are needed by other investigators than myself.

I think I am speaking for the majority of users in feeling that this nominal charge has been a worthwhile thing and has prevented over-ordering and wastage of these relatively short-lived materials.

The CHAIRMAN. You speak of a nominal charge?

Dr. WARREN. Yes, sir.

The CHAIRMAN. What do you have in mind?

Dr. WARREN. As I recall it in the treatment of a patient with radioactive phosphorus, which is one of the short-lived materials which we use, it amounts to approximately $1.25 or thereabouts.

The CHAIRMAN. Does that cover the shipping charges?

Dr. WARREN. No. That does not cover the shipping charges. The user bears the cost of the shipping charges.

The CHAIRMAN. I assume that is more expensive than the charge made for the isotopes.

Dr. WARREN. That is quite true, sir.

The CHAIRMAN. How much does that usually run?

Dr. WARREN. That varies with the weight of the shipment. The amount of shielding required for each isotope varies, so sometimes our container will weigh only thirty-odd pounds. Sometimes it may go well over 100 or more pounds. Also, it varies with the destination.

We obtain some materials—most of our materials—from Oak Ridge, and some come from Brookhaven. The charge, as I recall it, runs about $20 per shipment for us on the average in the New England area.

The CHAIRMAN. Any further questions, gentlemen? It seems to me that as we progress the hearing continues to increase in interest, so we will proceed in whatever way Dr. Bugher suggests. Whom would you like to have as your next witness?

Dr. BUGHER. I would like to continue with a discussion of the special program at the Brookhaven National Laboratory located on Long Island at the site of the old Camp Upton, operated for us by Associated Universities, Inc., which in turn is the operating agency for nine northeastern universities.

The Brookhaven Laboratory has a very vigorous and imaginative medical program, and the laboratory has been the pioneer in the utilization of neutron radiation from the reactor in the treatment of brain tumors. I would like to present Dr. Godwin to present the discussion of the Brookhaven program.

The CHAIRMAN. Dr. Godwin, we would be pleased to hear from you.

STATEMENT OF DR. JOHN T. GODWIN, PATHOLOGIST, MEDICAL DEPARTMENT, BROOKHAVEN NATIONAL LABORATORY, UPTON, LONG ISLAND, N. Y.

Dr. GODWIN. Mr. Chairman and members of the committee, I am happy that Mr. Roberts has identified himself and the recorder as being from Alabama, since at least I think they will be able to understand my Georgia accent.

At the Brookhaven National Laboratory we have a 35-bed hospital associated with a nuclear reactor, or atomic pile. All patients admitted are subjects for investigation of various diseases. The staff numbers around 15 scientists, composed principally of physicians, with a few doctors of philosophy of various training.

This combination of facilities enables us to utilize short half life isotopes and the nuclear reactors in investigative therapeutics.

The aim of the cancer research program at Brookhaven is to investigate the therapeutic application of nuclear energy in the treatment of human neoplasms with particular emphasis on the short half life isotopes.

Dr. Warren, I think, has adequately explained what we mean by the half life isotopes, and to reiterate, we are using half life isotopes with a half life of some 30 minutes, or 2 hours, or 8 days.

Now, radiations which disintegrate over a short period of time produce their effects by destruction. Our aim is to place the proper ionizing radiations in the proper place and to obviate as completely as possible the destructive effects on normal tissues. With some short half life isotopes we can accomplish a part of this in that a large amount of ionizing radiations can be localized to an area for a relatively short period of time with minimum damage to the organism as a whole.

For specific application of short half life isotopes I will briefly discuss the use of chlorine 38 with a half life of 38 minutes, which we have employed in several patients with ovarian carcinoma which has spread over the abdomen. This is a cancer that originates in the ovaries of the female and as it progresses spreads over the surface of the abdominal cavity. Ordinary ammonium chloride is irradiated in the nuclear reactor and is thereby made radioactive. Ordinary ammonium chloride looks very much like common table salt. This is then placed in the abdomen of the patient. This form of therapy caused a decrease in the fluid accumulations and size of tumor in these cases.

We have also used a gas designated as krypton 87, which has a half life of 78 minutes. We have done that in similar fashion.

I have a photograph which I would like to show that will show the effects of this radioactive chlorine in a case of metastatic cancer to the lining of the thoracic cavity, and if you are interested, I will be happy to pass this out.

I might point out that this [indicating] is the lung and this [indicating] is the area in which the radiation was applied.

Now another project is the use of radioactive iodine in the treatment of thyroid carcinoma. A large number of patients have been treated and at present the study is directed toward ways of concentrating the radioactive iodine in the tumor, optimal doses, and following the chemical course of those patients until death in some cases, with thorough autopsy observations.

Radioactive phosphorus, which has a half life of 14 days is being employed in the treatment of patients with polycythemia and leukemia.

I am sure that you are all thoroughly familiar with the term "leukemia" after yesterday's discussions, and I might point out for Congressman Dolliver that polycythemia is an increase in the number of red blood cells as opposed to anemia, as you mentioned yesterday.

It may be significant that in the treatment of these patients many physicians are being trained in the handling and application of radioactive materials. This gives us a reservoir of physicians trained in handling radioactive materials for the future national needs, such as in warfare.

Although ionizing radiations have a therapeutic application, they may also initiate a cancerous process, as was mentioned yesterday and this morning; therefore, it is necessary that we know whether the isotopes in the doses employed might incite cancer in patients. This has necessitated long-term experiments with animals given very small doses of isotopes in order to ascertain whether or not they may develop tumors.

We have projects of this nature which have been under way for about 16 months.

A more recent interest has been the development of a germanium titanium phosphate material which can be made up into glass needles. The phosphorus is made radioactive and the glass needle may then be inserted into a tumor giving a good local irradiation with later absorption of the needle.

This material is about ready for investigative trials in humans.

One of the most interesting and recent advances in the radiation therapy of cancer has been the application of thermal, or slow neutron capture by boron in certain brain cancers.

We have been talking about these ionizing particles. We are now dealing with one which has not been mentioned which is the slow neutron. It is a fast neutron which has been slowed down.

In conventional radiation therapy the intervening and surrounding normal tissues are irradiated as well as the tumor. This is detrimental to the patient and one of our primary aims is to reduce the irradiation damage to the normal tissues.

Theoretically, the use of thermal neutron capture largely obviates the damaging effect on the surrounding tissues.

To briefly describe the procedure for the therapeutic application of this type of radiation, a patient with a known malignant brain tumor is placed atop the nuclear reactor. I also have a photograph which will show a patient in position atop the nuclear reactor, and you should hold the photograph in this position [illustrating], since this is a mirror which reflects the patient in the compartment. The head is centered over an opening leading into the reactor.

Now, as a side point, certain changes have been necessary in the reactor in order to adapt it for this type of investigation, since it was not originally designed for this type of medical application.

While in this position a solution of boron is injected into an arm vein. This material immediately begins to concentrate in the brain tumor due to the abnormal changes in the blood vessels in the tumor. After a few minutes the concentration of boron reaches a maximum and about this time the nuclear reactor has reached its full power and the patient's head is subjected to the bombardment of millions of slow neutrons. These reach the tumor and where there is boron the atoms of boron grab the slow neutrons very avidly. When this happens the boron is converted into another form of boron, which in a millisecond is converted to lithium and a very highly energetic ionizing radiation term "an alpha particle" which Dr. Dunham has mentioned. This particle though highly energetic travels only a short distance, 8 to 9 microns, a micron being a thousandth of a millimeter, and actually this distance is about the diameter of a red blood cell.

This means that the radiations are principally limited to the area of boron concentration, that is, in the tumor, with little effect on the surrounding normal tissues.

To the present day, 10 patients have been treated in this fashion. Initially, the first 5 patients were given only 1 treatment; however, later patients have been given as many as 4 treatments. We believe that the results of these investigations warrant further study, and changes in the nuclear reactor for more extended studies and application of this therapy in other types of cancer have been made.

A nuclear reactor designed especially for medical investigation would considerably augment such studies, since a more satisfactory facility might be constructed for proper positioning of patients and a more suitable quantity of neutrons might be obtained.

These comments will serve to give you an idea of some of our investigations in cancer. However, I hasten to add that this constitutes only one phase of our applied medical investigations.

We also have an extensive program in the employment of isotopes in the study of fluid accumulations in the body, such as in children with kidney disease known as nephrosis, a form of Bright's disease, and in the study of high-blood pressure, hyperthyroidism and sickle cell anemia.

In summary, at Brookhaven we are investigating the therapeutic application of nuclear energy in an attempt to find new isotopes or improved methods for the use of isotopes in an effort to improve irradiation therapy in cancer. In addition to the use of these short half-life isotopes, investigations have been undertaken in an effort to utilize directly the nuclear reactor in the treatment of cancer to the application of thermal neutron capture by boron.

I thank you.

Mr. DOLLIVER. I was interested in your recital of procedures used in the treatment of brain cancer by the use of boron.

What has been the clinical results of those treatments?

Dr. GODWIN. We think that there has been some clinical improvement in these cases. I might add that all these patients have died, and we are now pursuing a very intensive investigation of the possible pathological changes which have resulted from the slow neutron therapy.

Mr. DOLLIVER. Of course, a brain cancer is generally about as hopeless a thing in medicine as can be imagined; is that not so?

Dr. GODWIN. Yes; it is. I think the average survival time for this high type of malignant tumor is about 180 days. Some of the patients live a little longer. There might be variations in the survival time of any one patient. One may live 2 years, possibly, but the average is about the 6 months' period.

Mr. ROBERTS. Doctor, is the information which has been obtained from work being done at your institution being made available to other institutions on an international basis? You are working in cooperation with other institutions, not only in this country, but in other countries of the world. Is that true?

Dr. GODWIN. Well, other countries have access to our publications. We publish this material in national medical journals which are open to inspection by physicians in general, and many of these journals go to other countries. Most of the information that I have mentioned here has been publicized in one way or another, either by talks or print. The germanium-titanium-phosphate needle is really a recent development and has just been presented at the American Medical Society.

Mr. ROBERTS. It has been mentioned that in practically all cases of brain tumor or cancer there are no cures or recoveries. As a usual thing, is that cancer of the bony structure of the head or the brain tissue?

Dr. GODWIN. That is a disease of the brain tissue itself, the supporting tissue of the neuron. The thing that supports the neurons is the glia, and this is a tumor of that supporting structure.

Mr. ROBERTS. I suppose these treatments are very expensive; are they not?

Dr. GODWIN. They involve the use of many facilities, many individuals very highly trained, and I would say they would be considerably expensive.

Mr. ROBERTS. Take an average case. What would your estimate of the cost be?

Dr. GODWIN. I am sorry that I am not able to give you a figure on that. I would not know how to break it down.

Mr. ROBERTS. Most of the cases you get, I assume, are pretty far advanced.

Dr. GODWIN. Yes. Patients with this particular tumor, generally, are in fairly bad shape. As we have indicated, they have a poor prognosis.

Mr. ROBERTS. It is a rather hard thing to diagnose, and I think in many cases it is far advanced before doctors even know what it is.

Dr. GODWIN. Like so many other cancers, it may not manifest itself until it has become a rather large tumor, possibly this large [indicating] sometimes.

Dr. BUGHER. I think it is true that all these patients were considered completely hopeless, with no prospect whatever other than a fatal termination within a period of a few weeks if not so treated.

Mr. ROBERTS. Changing the subject a little bit, I keep hearing a lot about these atomic-cocktail treatments for heart diseases. Are you familiar with that situation?

Dr. GODWIN. Yes.

We have not done this type of work at Brookhaven. It is being done in various parts of the country, but I know of Dr. Blumgart's work, who is in Boston, and he has been killing off the thyroid through the use of radioactive iodine, iodine 131, in the hope of reducing the basal metabolic rate and improving the medical situation generally. Possibly Dr. Warren could elaborate on this a bit, since Dr. Blumgart is from Boston.

Dr. WARREN. If I may speak, I have been following with great interest Dr. Blumgart's work. He is a close neighbor of mine and is also a faculty member of the Harvard Medical School. I have treated some cases of this type myself. The rationale for treatment is this: It rests on the fact that certain types of heart disease are brought about by an overloading of the heart. The secretion of the thyroid gland is one of the substances which drives the heart. By removal of that secretion, or lowering it materially, it lessens the load and converts a patient who is a cardiac cripple into a fairly well individual.

For example, a number of Dr. Blumgart's patients who are young women have been able to go through childbirth successfully after treatment.

One uses iodone treatment for this purpose because the thyroid has the function of picking up iodine very avidly. It feeds it in the

secretion it makes, so one feeds it radioactive iodine, which is then concentrated in the gland and giving off its radiation there serves to destroy the thyroid. Then a very carefully graded replacement of the thyroid hormones can be carried out artificially, if it is indicated, or if it is not needed, there is not a supply of the material. This is the way of making over an overpowering driving force on the heart.

Mr. ROBERTS. That is a relatively new approach to the treatment of heart disease; is it not?

Dr. WARREN. This type of treatment would have been impossible unless we had an atomic-energy program.

Mr. ROBERTS. We can say that the chances of success from this treatment are fairly good; is that right?

Dr. WARREN. There are a number of individuals who have been helped. One cannot treat every case of heart disease in this way, of course. It is only certain types that can be so treated.

Mr. DOLLIVER. You say if there is too much destruction of the thyroid by the radioactive iodine, then the thyroid material must be replenished?

Dr. WARREN. In certain instances it is advisable to give small amounts of thyroid hormones because it is one of the normal hormones in the body, and it is very much like weighing out substances in a scale. You will put in the weight that you think balances in the opposite pan of the scale and then you may have to add a little bit more to that weight to get the exact balance that you want.

Mr. DOLLIVER. Normally, the body itself functions to keep the thyroid balance; does it not?

Dr. WARREN. Normally it does, but in certain cases of heart disease this output of thyroid hormone drives the heart so hard that it cannot carry out its functions of keeping up the circulation, and the patient is a complete invalid.

Mr. DOLLIVER. After this treatment by means of irradiated iodine, do you find that the body again resorts to its normal natural balance of thyroid production, or do you have to continue this treatment, as for instance they do in the injection of insulin for the relief of diabetes?

Dr. WARREN. If the balance is struck just right, there is nothing that has to be done. In a few cases small amounts of thyroid hormone have to be given more or less continuously, much as insulin has to be given.

Mr. DOLLIVER. Of course, the determination of what needs to be done must be made by a physician?

Dr. WARREN. That is true.

Mr. DOLLIVER. Through a proper laboratory test?

Dr. WALKER. Yes; that is true.

The CHAIRMAN. In order that I may understand more in detail the hospitals that have been referred to, I would like to ask a question. Already hospitals have been mentioned at Oak Ridge, Argonne, and Brookhaven for cancer study. I would like someone to inform me just what is the nature of those hospitals. Are they research institutions entirely? Are they limited to a small number, or are they on a large scale? Are they open for general cancer treatment? Just what is the nature of these hospitals that you have referred to at Oak Ridge, Argonne, and Brookhaven?

Dr. BUGHER. They are entirely research hospitals. They have beds only for specially selected cancer patients who are a part of the research. The largest number of beds is at the hospital in Chicago, which is 58, so that there is no intent to open these hospitals for general admission of cancer patients. Each hospital is affiliated with other medical centers which act as the screening mechanisms to assist in the selection of the particular patients that should be received under these special conditions.

The object is to develop new methods. Once a new method is evolved, then it is something that can be used generally. I think Dr. Godwin made clear that at Brookhaven there are certain outstanding developments, one of which is the application of the slow neutron, the thermal neutron with boron inside the tumor cells to produce radiation being created or liberated within the cell itself. A background of his remarks is also the suggestion that they are thinking of a reactor designed, not for just physical experiments, or production of weapon materials, but for medical purposes exclusively that will come in time. We do not quite know what the reactor should be at the present time. It is very clear that the line they are working on is one of remarkable promise in the treatment of certain classes of tumors.

He also mentioned the recent development of this disappearing radiation source which is put in place, does its radiation locally, and is gradually absorbed and vanishes from the scene without any toxicity as far as the patient is concerned. It is a very stimulating development.

The CHAIRMAN. What is the number of patients in the several hospitals?

Dr. GODWIN. We have about 35 at Brookhaven.

Dr. BUGHER. There are about 20 for cancer.

Dr. GODWIN. That varies a bit.

Dr. BRUCER. Twenty to thirty at Oak Ridge.

Dr. BUGHER. Fifty-eight at Chicago. At San Francisco the laboratory does not have beds, but it is attached to a hospital that does provide the beds. These research beds cannot be compared to the bed capacity and requirements of a hospital giving treatments to a large number of patients as a routine thing.

If I may turn to the program of the Oak Ridge Cancer Research Hospital, directed by Dr. Brucer, this hospital is operated by the Oak Ridge Institute of Nuclear Studies and in the same way as the Associated Universities, Inc., bring the northeastern universities into the Brookhaven orbit, so does the organization at Oak Ridge bring the southeastern medical schools into a very close working relationship is connection with this hospital.

STATEMENT OF DR. MARSHALL BRUCER, DIRECTOR, MEDICAL DIVISION, OAK RIDGE INSTITUTE OF NUCLEAR STUDIES, OAK RIDGE, TENN.

Dr. BRUCER. Mr. Chairman and members of the committee, when in late 1947 Dr. Warren, with considerable encouragement from the Congress, suggested that we start up a cancer-research program, he did not make a unilateral decision as to the work which we would undertake; instead, he consulted a group of university medical schools on the type and scope of cancer research which the AEC might properly undertake.

The situation in cancer is exceedingly complex, and we knew we had to limit our studies within very definite bounds. We decided that what we should be doing in Oak Ridge are things for which Oak Ridge is particularly adaptable, that we should adapt our program to the tremendous facilities of Oak Ridge, and since Oak Ridge is the headquarters of the production of isotopes we limited ourselves to the study of isotopes. Since this was to be a cancer program we felt that we should limit ourselves also to the use of isotopes in the therapy and diagnosis of cancer in humans. Since we were a group of medical schools conducting a program using Federal funds, we felt that we should try to limit ourselves to the very, very practical studies. However, we wanted to define the word "practical" with the realization that what is impractical today might be practical tomorrow. This, we felt, was our main objective, to make some of the facilities of Oak Ridge in the use of isotopes which are practical today very practical for medical practice tomorrow.

The program also had one other phase. We would be a research hospital dealing with approximately 20 patients at one time. We did not have a service function. We did not have to accept a large volume of patients. We could take our patients from all the medical schools in the entire southern area. We could collect which patients we wanted, and since we did not have a service function and the immediate treatment of a particular patient, since this was not a necessity in our program, we felt that we could do certain studies which many hospitals could not do.

Most medical-school hospitals have to accept a large number of patients, and they have to do something for the patient immediately. They have to have a rather rapid turnover of patients. When patients are kept in hospitals for a long period of time it is exceedingly expensive. We did not have this limitation. We had only to deal with a very few patients so we divided our program into two phases, a phase involving the internal use of isotopes, where the isotopes were given by mouth, or injected into the vein, or injected into the abdominal cavity, or into the bladder, and another phase which was the external use of isotopes where you take a large dose of radiation and let it shine into the body.

On the internal isotope program there is one part of this program which is very important and which could not be done, or was impractical to do in many medical schools, and that is the one dealing with problems where the patient has to be watched over many, many weeks.

Since we can keep our patients as long as we think it is necessary, we decided to take a certain portion of our patient load from people who were in a hopeless condition, patients who we recognized would die in the hospital and who had hopeless cases of cancer. This would allow us also to experiment. It give us the moral background for doing new things, using new isotopes which might or might not be very dangerous and to use them in human beings.

There is a certain amount of work that can be done in animals, but certain things must be done in the human patient. Certain cancers appear only in human patients, not in animals, and they cannot be studied in animals; they have to be studied in humans. We thought that the proper place to start the studies would be on patients where, even if we made a mistake, we could not make much of a mistake, and so this is one phase of our program.

A small portion of our patients are terminal patients. On these patients we feel impelled to take more extreme measures as, for example, the use of some of the less well known isotopes involving, in some cases, higher specific gravity.

We also felt that our program should be to do things that could not be done at other medical schools. An example of one phase of this internally administered isotope program is well illustrated by the use of the particulate matter injected into the body which would not spread; it was not soluble in the body fluids. The radioactive gold work that was started by Dr. Hahn was also started by Professor Mueller of Switzerland working with an entirely different isotope. He was injecting colloidal or a very small or just barely visible particle of zinc, or of gold into the body, and since those particles were insoluble, they would not go into solution. They stayed just about where they were put.

There are many difficulties in working with such substances. The use of colloidal gold has turned out to be very valuable within the last few years. Many schools are now using colloidal gold for such things as carcinoma of the prostate and for the carcinoma of the ovaries. For the pleural effusion (the water that develops in the pleural sac from such things as carcinoma of the breast) with a large amount of radiation put into these cavities you can sometimes stop the production of fluid. This does not cure the cancer, but it makes the patient comfortable, up to 2 years, in some cases, and in about 30 percent of the cases it has been very valuable.

There are some things wrong with the gold isotope. It does not always go where you want it. It does not always deliver its radiation where you want it delivered. There is an argument among the people who are using this isotope as to why it does not always produce exactly the effect that you want. The arguments are generated around two phases. There are two kinds of radiation coming out of the radioactive gold. One is the beta rays which have a very short range but very powerful ionization where they do penetrate and are absorbed in the body.

There is another type of radiation and that is the very long range gamma rays which spread out through the body but have a weaker ionization effect when they are absorbed in the body.

Well, we can study this by taking an isotope which has only a short-range beta emission. It happens to be an isotope of yttrium. The isotope of yttrium has only a beta radiation and by using this isotype we can see if it has the same effect, if it can be used in the same way as gold, and if so, it would show us that the important factor, the important therapeutic agent we are using is the beta particle.

On the other hand, we have another isotope, an isotope of an element called lutecium, which has a beta particle but also a very low energy gamma ray. It is a combination. Both of these materials could be made into insoluble material and can be used, and so this is one of the things now that cannot be done very easily by schools outside of Oak Ridge. It demands very expensive and sometimes highly expensive preparation methods.

We feel, therefore, this is the type of study that we should take part in and concentrate our efforts on. Also, yttrium is associated very closely with the strontium isotope, which is very dangerous. This means that the use of this material as a new drug should be very

carefully considered before it is used on humans, and again we think that it should only be done with those very specially trained because if a mistake is made—and we are always likely to make mistakes—the mistake cannot be disastrous. This is one phase of the new isotopes for internal use.

The other phase of the program is on the development of external use of isotopes. Radium has a number of gamma rays. Some are very high energy and some are very low. Now for about 50 years it has been used as a source of these rays on the outside of the body to shine a beam of radiation inside the body. In the same way that the X-ray machine is used to destroy cancer. Many of these isotopes have these gamma rays and at various energies. Some have low-energy gamma rays and some have high-energy gamma rays.

In order to use an external beam we must have a very powerful source of gamma rays, and there are about 11 isotopes in the entire table which can be produced which have just the right radiation characteristic, so they could possibly be used for producing external beams of radiation.

The question comes up as to how to use these. We cannot copy the X-ray machine as it now exists. There may be a better way of doing it. The problem is exactly how to do this and what is the best way to apply this external beam of radiation. We did not think that we should make the decision, and so we got together a group of reputable representatives from 22 medical schools to join in an evaluation board to help us to decide how best we could apply these powerful external sources of gamma rays.

The program first developed about the problem which was mentioned by Dr. Warren in the testimony yesterday. It is very important that we make things available to many physicians. We can treat 1 or 2 but not 20 patients at 1 time. This is an insignificant contribution. What we do is no good unless many physicians can use it. And so we felt the first problem we should take is a very, very practical machine, something that could be used by many people. So we have designed, and there was shown to this teletherapy board just 2 weeks ago a small cobalt 60 therapy machine. This machine uses an isotope of cobalt which gives off a radiation which is equivalent to about a 30-million-volt X-ray machine. It is made up from cobalt, which is readily available to all of us. It is available to all hospitals that are qualified to use high-energy sources of radiation. And very important in the development of this machine, in working with the company that helped us develop it, we made the very strict stipulation that there was a cost to this machine which was very important. We said that the machine at its final development must be competitive with machines now available, the X-ray machines on the market, and so we have developed a small cobalt machine which will be priced somewhere close to the price of an X-ray machine. It has, however, some advantages over X-ray.

This is not the end, the theoretical end of the program. This is an adaptation, or a modification of what we really want in order to make something available today.

What we really want is to take the fullest dvantage of an isotope source of a powerful source of gamma rays. In every nuclear reactor

that has been built and that will be built, in order to keep the nuclear reactor going, there has to be a fission of uranium, plutonium, or some other fissionable source. When this fission of uranium occurs there is produced certain fissionable products. One is cesium. This means that no matter what kind of a reactor is developed by the commission, wherever it is developed, they will be producing the cesium. Cesium has a gamma-ray energy, which is equivalent to something between a 1-million-volt X-ray machine and the 2-million-volt X-ray machine. It is a waste product. It is produced whether we like it or not. There is a large amount of it being produced. Here is a source of energy that can be put to use, and so we have developed a cesium teletherapy machine which has as its main feature a small housing which can be easily manipulated mechanically. It does not have to have large power lines coming into it to keep it ctivated. Cesium lasts a long time, and since cesium is a waste product eventually, it should be a very economical and practical source of radiation. Therefore we designed the cesium machines so there would be a completely free rotating machine.

The whole problem of developing this machine shows a very interesting relationship to the studies that have been going on all through the Commission.

Cesium was discovered as an isotope in 1945. In 1947 they were sure it had the energy that we now know it has. In 1950 we were sure it could be separated in large amounts and at the end of 1953 we will have for the first time approximately 1,000 to 2,000 curie source, which is a very large source of cesium. This has taken only about 5 to 8 years from the beginning of the knowledge of a new isotope until it will be used in a practical sense.

There are many other sources that still remain. We do not have to stay completely on this type of source. There are other fissions producing the cesium isotope, the strontium isotope, which also can be used for teletherapy machines, and eventually, as soon as this initial problem of the small and large teletherapy machines are through this teletherapy board of seven medical school, they will go into the problem of other types of fission production that can be used.

Dr. BUGHER. Thank you very much. Are there any questions?

(The following information on the application of atomic energy for medical purposes in Europe was later submitted by Dr. Bruce for the record:)

REPORT ON EUROPEAN TRIP, JULY 1953, BY MARSHALL BRUCER, M. D., CHAIRMAN, THE MEDICAL DIVISION, OAK RIDGE INSTITUTE OF NUCLEAR STUDIES

I. PAPERS PRESENTED AT THE SEVENTH INTERNATIONAL CONGRESS OF RADIOLOGY AT COPENHAGEN, JULY 1953

For an estimate of the probable direction of development of the use of radiation in medicine, it is instructive to review the choice of subject of a large segment of radiation workers attending the International Congress. This estimate is highly biased by the economics of attendance and by the exhibitionist tendencies of the participants, but it is still the best first impression we can get of what people are thinking about. Table 1 shows my breakdown of the listed papers.

TABLE 1.—*The subject matter of 504 papers presented to the 7th International Congress of Radiology at Copenhagen, July 1953*

A. Diagnostic reports	212
Clinical diagnostic studies with ordinary equipment	54
Physics and techniques with ordinary equipment	35
Tomographic studies and techniques	32
Special angiographic methods and equipment	29
Correlation studies with anatomy-pathology-physiology	22
Fluoroscopic amplification, microfocal point tubes and cinefluorography	23
Contrast media, materials, methods, and equipment	9
High-voltage diagnostic equipment and problems	8
B. Therapeutic reports with ordinary equipment	102
Therapy of nonmalignant diseases	27
Therapy of malignant disease	75
All except those listed below	15
Cervix and uterus	11
Larynx	7
Breast	7
Lymphomas	6
Combined with chemotherapy	16
Classification, staging, and statistics	13
C. Special therapeutic equipment	64
Moving field therapy	19
High-energy accelerators	16
Multicurie isotope source teletherapy	8
Grid or selve devices	7
Ultrasonic and pure chemotherapy	6
Ultrasoft rays	5
Neutrons	3
D. Isotopes (other than teletherapy sources)	42
Diagnostic studies	7
Internally administered for therapy (I 131, p. 32, Ga. 72, etc.)	13
Semimechanical placement (Au 198, etc.)	6
Mechanically placed (seeds and needles)	6
Isotope production problems	3
Autoradiographic studies	7
E. Radiation biology	42
Studies of radiation effects	21
Chemical resistence and sensitizers	11
Whole body radiation and radiation toxicity	10
F. The problems of dosage and measurement	42
Investigation on radiation dose	21
Materials, methods, and equipment	13
Radiation protection	8
	504

One major departure from the program was the sudden appearance of three delegates from the U. S. S. R. At least two were immediately given a place on the program. The one I heard gave a talk in Russian on the subject of tomography in the middle of our symposium on integral dose. From the translation I judge that he said nothing I have not heard previously from American radiologists. Another Russian gave a talk on the use of cobalt 60 in teletherapy. Dr. Hol-

laender of ORNL was present at the meeting when this talk was given but he reported nothing beyond the fact that the translation was difficult to understand and that the U. S. S. R. is apparently producing cobalt 60 in sufficient amounts to make a teletherapy machine.

In the field of diagnostic radiology, which I am in no sense competent to judge, there was an overwhelming emphasis on tomographic and angiographic studies. There seemed to be more emphasis on the use of high energies in diagnostic equipment and high energy techniques than is apparent in the table.

In the field of therapy there was the usual emphasis on cancer. In addition, however, there seems to be an evergrowing realization that the reporting of results is the backbone of the field and that it represents an unsolved problem of first magnitude. There is continuing agitation for a worldwide standardization of classification and reporting methods and techniques.

In the field of special therapeutic equipment, moving field therapy was the outstanding subject of discussion. Many individuals have pet techniques usually built around an individual piece of equipment which they push as an outstanding new development. There seems to be a slowly growing appreciation among a number of men that the problem of the moving field is an extensive one and has many ramifications worthy of investigation.

High energy accelerators of various kinds seem to have a popularity out of proportion to their immediate practicality. There were more papers on the subject than machines in use. It is apparent, however, that a number of European manufacturing houses are actively engaged in selling machines and, as was pointed out repeatedly, that the high energy accelerators can be purchased while isotope machines must be begged for.

In the use of isotopes there was little that has not already been reported. A few special problems are noted later in this report. Outstanding were the papers by officials of the governments producing isotopes. It is obvious throughout Europe that both England and Kjeller are making a bid for a worldwide isotope market. At every place I visited there was praise for the Harwell isotope service. The amount of service that they perform is truly remarkable. A separate paragraph appears in this report on the cyclotron sales from Holland.

In the field of radiation biology the outstanding discussions were not the numerous ones on radiation effects but rather the amount of effort and thought being put into the problems of chemical resistance and sensitization to radiation. Although the field is an old one, and some of the compounds being used are in the books as failures, the results obtained show ever increasing encouragement. J. S. Mitchell's preliminary report will be published shortly and will describe an experimental method which is worth careful study.

The problems of dosage and measurement were among the most important at the meeting. Some of these will be discussed separately in the following report. The papers on instruments, methods, and equipment were on the whole a rehash of subjects already out-of-date in America. A few outstanding exceptions to this are discussed separately.

Of the outstanding importance were the deliberations of the international commissions. These were reported only briefly at the closing ceremonies of the congress, and will shortly be published in full in standard journals.

Briefly:

1. The eighth congress will meet in Mexico City in 1956.
2. An International Society of Radiology will be organized with its first membership taken from the present national societies.
3. The definition of the "r" remains unchanged up to 3 mev.
4. A new unit, the "rad", is defined as 100 ergs/gram.
5. A maximum permissible exposure standard was adopted for 96 isotopes.
6. A maximum permissible exposure for total body radiation was adopted.
7. New recommendations for handling isotopes and isotope bearing wastes were accepted.

II. ACTIVITIES CONCERNING TELETHERAPY UNITS

At Southampton, Dr. Taylor, therapist, and Dr. Clarkson, physicist, have designed a cesium 137 machine that will use either 2 or 4 sources of cesium 137 of somewhat less than kilocurie size. These sources are placed on a large, ring-shaped, double gimble that will completely surround the patient and that will allow most kinds of rotational therapy. By adding movements of the bed, any kind of moving therapy can be accomplished. The source shields are placed opposite each other so that the direct beam from one source, but not scatter, is always shielded by the opposite head. It is doubtful that the design of each

head has a sufficiently large area to shield the small angle high energy scatter from the opposite beam. The design is similar to one discussed with Dr. Smithers of the Royal Cancer Hospital early in 1952 and was included in our discussions with Grimmett early in 1950. Although the design will accomplish all kinds of motion, it is cumbersome to operate, it takes up much more floor space than is necessary, and both bed and machine must operate to get all kinds of motion. Little attention has been given to the problems of automaticity of controls and the repetition of pattern. The advantage of having the beam always enter at 180° opposing fields, thereby making wedge filters unnecessary, may be offset by the difficulties of stopping the radiation at selective points during their sweep around the body. Another advantage lies in the use of smaller sized sources and lower curiages. Treatment distances, however, may be closer than is usually contemplated with other rotational schemes. The cesium 137 source material is apparently being separated at Amersham.

At Oxford, Dr. Frank Ellis and his group have designed a large machine which departs completely from the usual concept of a teletherapy machine. It is an idea similar to the igloo that Dr. Newell of Stanford suggested to us last year. The idea has been under active design for 2 or 3 years and working drawings have been partially prepared for cobalt 60 sources. A large concrete cave is contemplated. Many small sources of cobalt 60 or any other isotope will be focused to one point within the cave. On a continuous, ellipsoid, single track in the ceiling, two beds are suspended directly opposite each other. The patient in the bed outside the cave is positioned under a series of lights duplicating the beams of cobalt 60 and is then pushed into the cave. One patient can then be irradiated while the other is being set up. The advantages of this design are the handling of two patients at once, the use of small-sized low specific activity sources, and fixed dosage, time, and field-shape relationhips. The disadvantages are that only one kind of 360° field is available with some theoretical possibilities of turning off individual elements of the source. With the great number of moving parts in the machine the maintenance and calibration costs may be higher than expected. The suspension-bed mechanism will have to be a precision machinery job and is not so simple a design as that suggested by Newell. The fixed pattern of the radiation field is adaptable to only certain tumors, but Dr. Ellis' large service has sufficient patients that he can afford a machine for limited use. Neither Dr. Ellis nor Dr. Newell agree, but in my opinion an intense field field of scattered radiation within the cave will build up the integral dose to unacceptable limits. The cost of building and loading such a machine will be prohibitive unless most of the work is done by home talent not counted in the cost. In my opinion, if high specific activity sources were available at low cost, such a design would not be considered even by Dr. Ellis.

In Cambridge I saw the teleiridium unit described by Freundlich Haybittle and Quick (Acta Rad., *34*: 115, July 1950). The advantages of this machine over the radium unit it displaced are obvious. No one considers it more advantageous than the same machine would be if it could be supplied with a longer-lived isotope. According to Dr. Mitchell, however, the use of the 70-day isotope is not so great a chore as would be expected. A routine procedure is now set up for monthly interchange of iridium sources. For an organization within cheap trucking distance from a reactor, the use of such a short-lived source has proved practical. Yet if many of these sources were put into operation logistic difficulties would soon arise. In spite of the availability of short-lived sources, no other groups have attempted to develop the idea in and around Harwell. The number of advantages appears to be insufficient to compensate for the continuous maintenance cost. The machine is adapted from an old Grimmett radium-pack design with the shielding of uranium. It is thus one of the smallest and most maneuverable devices I have seen. The use of nonfissionable uranium metal as a shield for housing therapy sources in the United States should be reexamined.

At the Royal Cancer Hospital in London, Dr. Lederman demonstrated several new uranium treatment applicators for the two radium packs he is using. Some of these are of irregular, rectangular, and triangular shapes, and have great advantages in reducing the transmitted penumbra at close distances, especially for radium and cobalt energies. The use of irregular fields is in line with Lederman's desire to shape the field of effective radiation to fit the tumor. While shaping of a field is best done with some form of rotation or moving fields, such complications are impossible with the low intensity of the old radium packs. Lederman appears to be far more interested in the development of the shaped fields which are possible with complete freedom of rotation.

At the Royal Cancer Hospital, Dr. Smithers and Dr. Wheatley showed me the projected designs for a rotational cobalt 60 or cesium 137 teletherapy machine. The principle is similar to that shown in the model of our preliminary device exhibited in August 1952 (but without the secondary extension for conical rotation which, in the Royal Cancer Hospital machine, would be accomplished by moving the bed). The engineering is farther advanced than we had gone before we discarded the idea, and consists of a single large casting that would be both counterweight and suspension arm. The casting appears to be extremely expensive and although it offers the opportunity for investigating most forms of moving field therapy, this process can be accomplished only by moving both bed and source simultaneously. Such simultaneous movement seems difficult to set up and to duplicate with precision. A preliminary model of the unit has been constructed.

At the symposium on teletherapy units at the annual meeting of the Faculty of Radiologists, Dr. Johns (Saskatchewan) discussed a modification of the diaphragm of the Saskatoon cobalt 60 unit for accomplishing a continuously variable rectangular field size without increasing the small size of the nose of the Saskatoon unit. Dr. Johns has placed a series of interleaves of steel-jacketed lead down the length of the collimating tube. These crossbar interleaves are thick toward the source and become thinner at the skin end so that the problem of nonuniform penumbra is effectively solved and the field size can be adjusted by two finger-action screws. Circular and irregular fields are impossible except with individual adaptors; thus, the unit is of value only on stationary or multiple field techniques. It is, however, a big advance over the clumsy arrangement of our first design. It has an advantage over our circular portal continuously variable diaphragm in that it takes up much less space close to the body when used for stationary fields. For those who are not interested in moving fields (a minority outside of the United States) the Johns' design should be seriously considered. This diaphragm arrangement has been adapted into the commercially available Picker unit.

Dr. Moffatt (Vancouver), who has used the early Eldorado design, presented preliminary clinical results. His impressions that cobalt 60 has an advantage especially in skin reaction and depth dose are similar to those of many others. Dr. J. R. Clarkson (Southhampton) presented the previously discussed design for his cesium 137 unit and some of its advantages in rotational fields. Mr. Eastwood summarized the problems of cesium 137 production and the characteristics of the cesium isotope. Much of the material he presented is similar to that found in the ORINS report on cesium 137. The problem of production from English fission products is essentially the same as that in America. A precipitation process, however, is being used rather than the ion exchange process of Oak Ridge. Following Mr. Eastwood's talk on cesium 137, I presented the preliminary designs for the ORINS teletherapy machine and some of the reasons for including cesium 137 in a consideration of teletherapy sources.

In Switzerland, Dr. Muller has given little attention to the problem of teletherapy primarily because the university has a cyclotron and has little hope of funds for purchasing a large isotope source. The story in Geneva was the same. At Heidelberg there is an intense desire to obtain a large radioactive source, and Professor Becker has a room set aside for a teletherapy machine in his new laboratory. The present impossibility of obtaining funds for purchase of the isotope is holding up the consideration of design problems. Dr. Becker, however, would consider only a complete rotational design. He is at present using one of the Muller (North American Phillips) 360° rotational 250 k. v. p. machines and has found it superior to his other low-energy machines. He has experimented with a number of tumors (including stomach) which he would not have considered with multiple fields and is enthusiastic about the preliminary results. At the present time he is installing a 15 m. e. v. betatron with pendulum motion since even at betatron energies he considers rotation an absolute necessity.

In Paris, Dr. Simone Laborde is using an historic radium pack. The machine is of simple design consisting of a pot of lead with a large master opening. A through and through lead plug lined with steel rotates by an electric-powered motor and a manual control. The source is approximately 5 by 5 centimeters with radium in multiple capsules. There is little in the design that does not appear in Failla's early articles. A wood cover is used over the treatment applicators and undoubtedly causes a serious increase in low-energy electrons close to the skin. The treatment cones are of lead lined with steel and all contain these wooden electron filters. There is little positioning gadgetry. The switch

is manual but with the long treatment times this seems justifiable. The machine is in constant routine operation. No outstanding research or observations were available for this discussion. Dr. Loborde's results have been reported periodically in the French literature.

Of far greater personal interest was the work of Professor Tubiana, Dr. Dutreix, and their associated physicists. They have just installed a new Allis-Chalmers 24 m. e. v. betatron which seems to be the primary interest of the department. No patients have yet been treated; all work has been on the physical measurements of the beam. Since this recent purchase they have measured only the central dose lines for a very few fields. They contemplate the first use with patients sometime in October. Considerable work is being done particularly on problems of scattered radiation, which is of great interest to Dr. Tubiana.

At the Seventh International Congress there was a surprisingly large turnout for the cobalt 60 reports. Dr. Braestrup (New York) presented the dose distributions in water phantoms using a small mockup of his rotational design. Ionization chamber and photograhic measurements were presented for stationary, rotating, and oscillating patterns. Dr. Miller (Sheffield, England) described a modification of their old 5-gram radium pack to accommodate a 50-curie cobalt 60 source. His data on the dose distributions at a 15 c. m. source-skin distance showed the physical superiority of cobalt 60 over radium, but to my thinking pointed up even more strongly the fallacy of using 50 curies when larger sources could so easily be made available. Dr. H. R. Marcuse (Hague, Holland) described a low-cost, homemade cobalt 60 unit which is, for all practical purposes, the same as the Failla-Grimmett idea. The machine was designed to hold 1 kilocurie of cobalt 60 which they eventually expect to get. They now have it loaded with a 250 curie source. The criteria they used in setting design requirements were interesting: (1) Conventional larynx therapy must be possible for which they demand a minimum of 25 centimeter source-skin distance. (2) Conventional abdominal therapy must be possible for which they demand a minimum 40 c. m. source-skin distance. (3) The overall irradiation during the treatment by leakage radiation must not exceed the scattering from the treated volume of tissue. This last demand is actually far less stringent than the criteria we used in our design. Our reasons for being more strict concerned not so much the patient but the MPE of the operators during setup time. Dr. Marcuse's demonstration served primarily to point out the tremendous economic advantages of the isotope sources from the point of view of all phases of treatment once the source itself is made available.

During the therapy sessions Dr. R. W. Johnson (Los Angeles) presented the preliminary results with a series of inoperable bronchogenic carcinomas and carcinomas of the bladder. Dr. Johnson described the machine now in operation at the Los Angeles Tumor Institute. He indicated a feeling of improvement of the immediate palliative results over those of 250 k. v. p. therapy. Some dramatic regressions of pulmonary and mediastinal lesions were demonstrated. Dr. Burkell (Saskatoon) presented some of their work on applicator design and on bolius materials in the path of the beam. They have investigated the skin effects of cobalt 60 and have noticed a "thickening hardness" under the skin not previously noted with other forms of radiation therapy. The Saskatoon group is beyond doubt making the most significant investigations of conventional techniques with cobalt 60 of any of the groups now publishing papers. Dr. Ivan Smith presented a general statement of his work with the Eldorado unit at London, Canada.

II½. RUMOR AND SCUTTLEBUTT

During the discussions with many of the therapists and physicists of Great Britain, it was brought out that a report had been prepared by the Medical Research Council of Great Britain on the direction of major emphasis in the official policy toward various forms of radiation therapy. Apparently all major allocation of funds for new and experimental equipment is controlled by the Medical Research Council. Since the early papers on isotope machines, especially since the report on cesium 137, there has been a considerable pushing by various radiotherapy and physics groups to be allowed to build, design, or purchase a teletherapy machine. At the same time considerable emphasis has been placed on the development of high-energy accelerators. To determine which of these is the most logical and effective, and which could best be pushed with the available funds, they formed a committee which consisted of an equal number of therapists and physicists. The report of this committee compared the calcula-

tions of all the essential data on low- and high-energy X-ray generators, cesium, and cobalt isotope machines, and very high energy accelerators. The report brought out the fact that the physical data showed all machines to be considerably superior to the usual X-ray generators and that each had various advantages and disadvantages so that no single machine could legitimately be either discarded or accepted to the exclusion of all others. On the basis of the estimates of total economic cost, in spite of a considerable bias against cesium 137, it turned out to be most economical of all types of units. Although this should have invited an immediate emphasis on cesium 137 production, such did not occur since two members of the committee refused to recommend cesium. I have talked to all of the members of the committee and many others who were acquainted with the committee's functions. There are apparently a number of specific objections to cesium 137.

(1) In a discussion with Patterson, he stated that the penumbra of the cesium 137 source beneath the skin surface was inferior to that from very high energy machines. This is true but only to a minor degree, since most of the scatter at 660 k. e. v. is forward in low Z materials. If the scatter penumbra beneath the skin is compared to 10 to 20 m. e. v. radiation, then both cesium and cobalt are physically inferior. If compared to 250 to 1,000 k. v. p. X-ray generators, then both cesium and cobalt are physically superior. Published phantom measurements have answered the practical question for cobalt 60. Calculations that have been made shown cesium 137 to be essentially similar to cobalt 60 but since, as yet, there is no large source there are no phantom measurements. All of the physicists in England that I talked to, with one exception, believe that Patterson's argument is in favor of rather than against cesium 137.

(2) The second argument against cesium 137 was given by one therapist who did not believe it to be a serious argument and was unsure of its validity. If an atom-bomb attack explodes near one of the cesium 137 machines, the addition of many thousands of curies of cesium 137 to the already present fission products from the bomb would increase the long-term hazards of atom-bomb attack. This argument can be answered only by comparing estimates of the amounts of long-lived fission products produced in various sized atom bombs and the chances of shattering a large lead protective shield. If an explosion is close enough to vaporize a lead shield, all of the shield's radioactive contents will be carried up into the cloud. If the explosion is at such a distance that a 1-ton shield is only melted, then the Cs 137 or Co 60 will be trapped in a safe container. Based upon rate of metabolism, energy and body distribution studies, the international commissions seem to believe that there is a much higher allowable body burden for Cs 137 than Co 60. Hence, the Cs 137 machine is safer than a Co 60 machine with equal output. From the figures on allowable concentration in water, Cs 137 is either 10 times more dangerous or 100 times less dangerous than Co 60, depending upon which way the international commission jumps. The argument is an exceedingly difficult one to answer but I think it is a molehill-mountain argument.

(3) The third argument was brought up by one of the physicists who is working with a high-energy cyclotron. When the electron buildup immediately beneath the skin is studied for very low and very high energy electrons there is a steady increase in the depth of peak ionization with increasing energy. From the point of view of physical measurements this is true; however, the practical question is, At what energy is the peak sufficiently deep? If one wishes to treat deep-seated tumors at the peak ionization, then the primary photons must be at very high energies. If one considers only the isotope range of energies, the peak ionization should be beneath the germinal layer of skin or a depth of at least 0.1 to 1 millimeter. In an article in press we show that, with cobalt 60, improperly designed treatment cones can bring the peak to the surface of the skin but that proper design lowers its depth to about 2 to 4 millimeters. Cs 137 has not yet been measured but should be about 30 percent less deep.

Some persons considered the percent of peak ionization at the surface of the skin important since it will determine the dose at the germinal epithelium. For cobalt 60, under best conditions, the percent of peak ionization directly at the germinal layer of skin is about 30–40 percent of the peak. It has not yet been measured for cesium 137. The practical point of this argument disappears, however, if multiple or moving fields are used.

The consensus of opinion among about 30 physicists and therapists in England is that cesium 137 is potentially a far more economical source than any other and should, for all practical purposes, be as good or better than any other isotope source for therapy. There is a fair degree of uncertainty on the economic

phase of isotope versus very high energy accelerators. With some outstanding exceptions, the accelerators are generally considered expensive and are maintenance problems. There is no uniformity of opinion on the relative therapeutic value of various energy radiations.

III. ROTATION AND MOVING-FIELD THERAPY

If any one problem can be said to be foremost in the discussions on radiotherapy, it is the emphasis now being placed on moving-field therapy. The word "rotation" has been largely superseded since it does not include some types of motion that are not rotatory and, hence, the phrase "moving fields" has been adopted.

In a symposium on moving-field therapy Dr. Felix Wachsman (Erlangen, Germany) described some of the disadvantages of overlapping adjacent fields and various forms of multiple-field patterns. It was his contention that most of these disadvantages could be overcome by a continuously moving beam. He described a number of types of moving fields. First is "rotation therapy" with the tube stationary and the patient, seated or erect, slowly rotating about a vertical axis in a horizontal X-ray beam. The biggest advantage of this technique is the possibility of correcting the adjustment by continuous screening through a fluoroscopic visualization of the beam. He demonstrated his method of obtaining precision adjustments of even small fields. A second form of moving field is the so-called pendulum therapy. In this technique the X-ray tube swings around a horizontal axis of an immobilized patient and only describes an arc that is a portion of complete rotation. He believed that few advantages could be demonstrated for this method, although he pointed out that it made possible treatment of tumors with a longitudinal axis parallel to the axis of the body. My impression (although he did not imply such) was that the biggest advantage was the engineering of the machinery. The third technique he described was what he called convergent-beam therapy (similar to Green's horizontal-arc therapy). The central ray is always directed on a point of convergence and results in an X-ray beam comparable to a convergent lens. The technique he described was the Siemen's spiral movement over a circular skin area. He pointed out that one of the big advantages of convergent-beam therapy is that it can be based on standardized isodose curves that are adaptable to any shape and depth of tumor. For each type of motion Wachsman was using separate machines all made by the Siemen's Co. My own impression was that he was describing the advantages of three specific engineering designs rather than the concept of a moving field.

Immediately following the congress there was a postgraduate course on moving-field therapy held at the Medical Clinic of the University of Erlangen and allegedly supported by the Siemen's Co. In the technical exhibits Siemen's showed 250-k. v. p. apparatus which performed pendulum, spiral, and convergent beam and rotation therapy. Also shown was a 15-million-electron-volt betatron for pendulum therapy. The Muller Co. (North American Phillips) demonstrated their TV1 model for continuous 60-degree rotational therapy.

Dr. Palniere (Bologna, Italy) described a method of convergent beam therapy which he called En couronne. This method uses a stationary tube over a horizontal patient upon a moving table. It is identical with the horizontal arc therapy in England. Palniere described a number of centering and positioning devices and various kinds of filters to achieve a homogenous field of radiation in the area of the tumor. Another method Palniere pointed out as his discovery was a scanning type of therapy similar to a tomographic projection of a diagnostic machine. He was quite excited about the possibility of building up homogenous fields of concentration, especially in flat plates of tumor using tomographic scanning methods.

Dr. Jens Nielsen (Copenhagen) demonstrated his equipment and reviewed his work of many years of using a horizontal beam with a rotating patient. His results indicated sufficient improvement over ordinary stationary fields to justify further study of rotational methods. Both Wachsman and Nielsen pointed out that there are indications and contraindications for each of the various types of moving-field techniques. Johns (Saskatchewan) described the rotational floor stand that is being used with the cobalt 60 unit in Saskatoon. He presented some of his calculated isodose pictures which showed the remarkable uniformity and precision that might be obtained with simple rotational patterns. Nakaidzumi (Tokyo) discussed much of the same material as Wachsman but included one further kind of moving field, that of the tangential approach to the body. He gave primarily a historical summary of various methods of rotation and seemed to have

more of a feeling for a moving field (rather than a dependence upon an engineering design) than did Wachsman. Quimby (New York) presented her methods for calculating dosage and described the use of various kinds of wedge filters and bolus material in horizontal arc therapy. She seems to faver the use of the term "convergent beam therapy' 'to distinguish it from vertical arc rotational therapy.

Dr. Gunther Barth (Erlangen, Germany) described the experiences of 3½ years with Siemen's spiral path convergent beam apparatus. He showed that all of the deep, approximately spherical-shaped tumors could be attacked by this method but not the long-stretched-out tumors. He demonstrated that tumor doses up to 8,000 r. could be applied even at 250 k. v. p. without passing the skin tolerance. He also gave some simple factors that could be used to calculate tumor dose from standard isodose charts. Dr. Sangster (Amsterdam) described a gadget and a method of obtaining 3-dimensional pictures of any distribution of crossfire radiation with 3 or more bundles of primary photons. It was essentially a geometrical method of determining the curves of intersection of surfaces determined by the isodoses of intersecting beams of radiation. He pointed out some of the complications of square or rectangular fields used in multiple-field techniques and, hence, also applicable to moving fields. He described a simple method for arriving at an approximate 3-dimensional picture that did not depend upon the photographic procedures of Howard Flanders at Hammersmith or the point-by-point construction method of Mayneord at the Royal Cancer Hospital. Lokkerbol (Amsterdam) described a combined radium X-ray treatment of cervical cancer. The radium methods were based on the Paris technique. He used a wedge-filtered convergent beam moving field to obtain optional dose distributions in the pelvis. Andreas Siegert (Erlangen) described some systematic measurements using a 70-millimeter^3 volume microchamber he had made in a water phantom fitted with a female bony pelvis. With this equipment he investigated the combined use of radium applicators and the convergent beam (Siemen's spiral) method of rotation. He found that it was possible to fill up some of the holes in the three-dimensional radium isodose pattern by using various field-focus diaphragms. He was able to avoid overdosage of rectum, bladder, and skin, and seemed excited about the possibilities of the combination of the two methods.

In discussions of some of the dosage patterns of the Germany machinery, Smithers, of the Royal Cancer Hospital, described a series of his experiments using a sword swallower from a circus and a small measuring device on the end of a long wand. The actual measurements he got in the esophagus using one form of rotational beam were considerably different from those calculated. He pointed out the need for a much more detailed investigation of the dosage picture in rotating beams.

Hare and Trump (Boston) gave their usual excellent presentation of the observations they have made using the 2-million-electron-volt Van de Graff in a simple rotational pattern. This material has previously been presented in American meetings but they are building up a greater patient load that is making their presentation more and more impressive at each meeting.

Peterson (Burlington) was said to have presented a paper on a new apparatus for moving-beam therapy. He discussed the problem of producing a three-dimensional isodose pattern whose shape would closely approximate the shape of the tumor under treatment. He described a mechanism that would allow the rotation of a tube about a tumor mass with continuous variation and speed of vertical and horizontal motion and at the same time a rotation of the tube itself. Desaive (Liege, Belgium) gave a theoretical statement on the principles of the application of teletherapy machines with isotope sources to moving fields; and using various kinds of electronic devices to fix the course of motion, he emphasized the idea of automatic adjustment of the beam. Krebs and Anderson (Aarhus, Denmark) presented their results on 300 patients with cancer of the esophagus. They pointed out that the curative effect was only about 2 percent but that the average survival time was doubled after the adoption of rotational therapy and is now about 9 months. They, however, were doing their work on patients who were in poor condition on admission and feel that the results are comparable to that obtained by surgical methods. They were impressed especially by the palliative effects and believe that if they had selected patients early in the course of the disease, as they plan to do, they would have been able to get much better results than they now present.

In all of my discussions with persons doing some sort of moving-field therapy, a number of points became obvious. The Germans seem to be talking only of a particular machine that performed a certain type of motion, and their ideas of rotation were fixed by the engineering of the machine. Many of the others,

especially the Italians, spoke of a pet technique of their own. Very few, and these were the English, Becker in Germany, and Muller in Switzerland, seemed to appreciate that a machine can be made to accomplish any motion and that the primary purpose is to build up shaped fields of radiation within the body. Outstanding among the groups thinking along these lines are Smithers and Lederman at the Royal Cancer Hospital, Green at the Royal Northern Hospital, Taylor at Southampton, and almost all of the English physicists attending the meetings.

IV. THE INTEGRAL DOSE PROBLEM

One of the problems brought up at the discussions following the faculty of radiologists meeting was the general agreement that radiation therapy of the future would be primarily directed toward the establishment of a shaped field of concentrated radiation and that this could be accomplished in a beam geometry only by the use of moving fields. This general idea was more or less agreed to by most of the therapists and physicists with whom the problem was discussed, but there was also concern over the limiting factors of moving-field therapy. In summarizing the discussions with many people it seems that these limiting factors are:

(1) The complexity of the routine determination of the three-dimensional isodose patterns resulting from a complex moving field. It seems to me that this is not a true limit to moving-field therapy since the methods for solution are well known. The complexity that makes a problem of moving fields is in the great mass of tedious work necessary with known methods. I believe that the bottleneck in using complicated moving fields is the development of an automatic three-dimensional isodose plotter which will reduce this mass of tedious work, and the concurrent development of a group of technicians who can quickly adapt moving fields to individual patients.

(2) Determining the shape of the required field is a problem in diagnostic radiography and is an absolute limit to any but the simplest moving-field patterns. The development of diagnostic methods, however, is proceeding rapidly in the fields of tomography and various new forms of machinery have been suggested. Mayneord's department, particularly, is now investigating a number or ultrasonic devices that do not depend upon tissue density as does X-ray, but on something similar to tissue elasticity. Various other forms of tumor localization methods with isotopes are under investigation and are discussed more fully later.

(3) The major problem in moving-field therapy seems to be that of integral dose. With the development of more complex moving-field patterns an evident increase in the total radiation absorbed by the body outside of the field of concentrated dose might be the ultimate limiting factor of any moving-field pattern provided Mayneord's megagram roentgen definition of integral dose is used. Some criticisms of the original definition of integral dose, however, are of great importance.

Dr. J. E. Roberts (University of London) began the discussions at the integral-dose symposium and I quote his abstract in full since, in my opinion, it was the most important single paper presented at the congress.

"Some Limitations From the Concept of Integral Dose

"Since the concept of integral dose as a measure of total energy absorbed in the body during radiation treatment was introduced some 13 years ago, considerable changes in outlook have occurred in the field of dosage. This is particularly evident in the relation between tissue ionization and true energy absorption. Although the point may be academic, there can be little justification for the retention of the megagram-roentgen as a unit of integral dose in preference to the joule or calorie.

"A disappointing feature has been the absence of conclusive evidence of a close relationship between integral dose and any clearly defined or measurable form of constitutional radiation reaction. Expectation of such a correlation was based largely on assumed production by radiation of a universal toxic substance, presumably common to all or most tissues. The evidence for such a product other than those common to all necrotic processes is not yet conclusive.

"The greatest difficulty in the application of the integral dose concept arises from the variation of sensitivity, with respect to constitutional effects, of different tissues. This can lead to gross differences in limiting integral dose according to the physical technique used. It is suggested that greater atten-

tion should be paid to the distribution of energy deposited in the body during treatment with particular reference to the integral dose in known sensitive tissues."

In the discussion that followed the paper, Mayneord stressed the fact that his introduction of the integral dose concept was a first approximation and was not intended to be the final answer. Throughout all of the discussions both at the Congress and in individual talks a few basic ideas were repeated.

(1) Integral dose is a first approximation concept and the method of calculating it is only a first approximation to the concept. A measurement of the true integral dose is now probably available for the first time with chemical dosimetry and will be a check on these calculations; but since in the phantoms in which chemical dosimetry is carried out the concept is that only of total absorbed energy, the measurement will still be only a first approximation idea.

(2) Integral dose defined as total megagram-roentgens assumes the body to be a uniform water phantom, an assumption that is entirely too simple. The ever increasing work on liver, spleen, marrow, and partial body irradiation shows marked differences in sensitivities of the various parts. Mayneord has already anticipated these criticisms in his articles of the 1940's.

(3) To a certain extent the megagram-roentgen unit is tied to the operating definition of the roentgen. At the Congress a new unit has been proposed—the "rad" which is defined as 100 ergs/gram. How this unit can be applied to the concept of integral dose has not yet been determined but there are immediately visible possibilities on an operational level. With the possibilty of chemcal dosimetry the total volume absorption of energy under any condition is a simple measurement for any one condition but is tediously complicated by the large number of possible combinations of conditions. I can see no way of generalizing it to a single formula. The conversion to "rad" units will necessitate actual measurements of absorption in tissues. On a macroscopic dosimetry scale this, too, is a simple measurement problem and is already being done at ORINS and other centers. It is apparent, however, that even if a true integral dose could be measured under certain simplified ideal conditions the criticisms of Roberts and others might still hold true since the effective pharmacological action does not take place in a macroscopic scale but within areas of a size corresponding to a small multiple of the average range of the secondary electrons. This concept of microdosimetry is an essential element in the future development of therapy with radiation.

Following this discussion Rajewsky (Frankfort, Germany) described a large series of experiments (largely in the field of total and partial body irradiation) which pointed out that the integral dose concept must be changed to take into account the individual sensitivities of various organs. Henry Kohn (San Francisco) pointed out in a detailed discussion the necessity for a biological; as well as a physical dosimetry.

V. TRAINING OF CLINICAL PHYSICISTS

The problem of the supply of clinical physicists (hospital physicists in England) had been chosen for detailed study and recommendations to subcommittee No. 6 of the TEB. Throughout my European trip I made a point of discussing these problems with about 20 or 30 hospital physicists and many therapists and isotope users in all of the countries visited. Dr. Mayneord was especially interested and has a real concern over the adequacy of the system he helped to build many years ago in Great Britain.

Apparently there are an insufficient number of hospital physicists in Great Britain and there is a real problem of recruitment. With many exceptions the system followed is about as follows: Students who have qualified with honors in physics (chemistry or math) in the British university system are apparently on a par with our outstanding students who have taken a B. S. degree with a major in physics. These students are hired to work at the lowest of three grades of hospital physicist. Their salary scale seems to correspond with a $3,000 to $4,000 yearly salary in America. They have had no previous experience in medical problems. As a junior-grade hospital physicists they receive on-the-job training from a higher grade physicist and from the therapist. This introductory on-the-job training is apparently fairly well but informally standardized. The techniques of individual patient dose calculations, equipment maintenance, calibration, dosimetry, and therapy preparation are fairly routine. If the student is interested and has the mental equipment, he continues his

studies and along with his work he is allowed to take what we would consider a master's degree. The university curricular regulations are not as formalized as in America and the diploma does not seem to be as outstanding a milestone as we make it. With sufficient proficiency the physicist is advanced to a middle step corresponding in salary to a $5,000 to $6,000 level in America. At this point he is expected to be well acquainted with the standard procedures and is given considerable responsibility in routine matters. It is expected that he has accepted hospital physics as a lifetime job and he usually stays in the field. During the next few years he acquires a reputation and there is often a shifting of jobs from one center to another. The final step is the development of research ideas and the taking on of greater responsibilities in teaching. It would correspond to the acquisition of a Ph. D. degree in America, although the situation is not nearly so formalized (on the university curricular, residence, examination time schedule) as we are accustomed to. Some of the best hospital physicists in Great Britain do not have a doctorate or receive it very late in life. This is neither a handicap nor an indication of lack of scholastic efficiency as we might consider it. The only formal distinction I can see which marks the next step is a salary increase to the position of senior hospital physicist. This corresponds to our $6,000 to $8,000 level. Many persons get their degrees long after they have become a senior grade physicist. Some have received doctorates at a much lower salary level.

Because of the close association and frequent contact (most top-grade hospital physicists seem to know every other one in Great Britain) the on-the-job training is very standard. A man can shift from one center to another without disturbing his daily pattern of routine activities. The types of research being done and the opportunities for such is an entirely different matter. With a few outstanding exceptions the research opportunities, especially the time, money, and equipment, seem to depend upon the medical doctor in charge. The medical doctor's opportunities in turn seem to depend entirely upon his relationships with the Medical Research Council. One of the outstanding disappointments of my visit to Great Britain was seeing the tremendous patient load on men who had unlimited research ideas. Even men with the reputations of Mitchell, Smithers, and Lederman have patient loads big enough for 2 or 3 men. This patient load along with the centralization of research into a few large centers, without even crumbs for the hinterlands, has caused much discontent among both physicists and therapists.

The relationship of the therapist and the physicist is not generally that of the glorious wedding of two technical specialists working as a team to further the interest of each patient as we have sometimes been led to believe. I heard of many cases in which an omniscient physician treated the physicist as a second-class citizen. Nothing much of value seems to come out of these centers. I personally visited very few centers, and these were carefully chosen, but here the relationship is more like that of the ideal recognition by each man of both his own limitations and the other man's responsibilities.

It is impossible to generalize but in trying to find out whether there was anything besides personality that made the difference between a good and a mediocre physicist-therapist combination, it seemed that where the M. D. had an excellent understanding of physics he had an active physicist working with him. Also, where the physicist had a good understanding of human physiology, they often were very productive and the M. D.'s associated with them were willing to subordinate their own judgment on nonclinical phases of the problems.

For the most part the clinical physics situation in countries other than England appears to be in much the same position as in America. In the centers where I was able to talk to physicists there was no evidence of formal training. In Becker's Institute there is one physicist who seems to have an excellent understanding of his duties. He took his usual training at the University of Gottingen, then went to work for one of the large X-ray commercial firms for sufficient time to become acquainted with the X-ray machinery. He was then taken over by Drs. Becker and Scheer, who are giving him the clinical part of his training. Most of the routine physics in Heidelberg is done by a large staff of techinicians who are trained in the department at Heidelberg. Dr. Becker was of the opinion that in 4 or 5 other places in Germany there was as much activity as in his department. The rest of the centers, however, had only relatively routine technicians and did little or no investigational work. In France, the Gustave Roussy Institute had a number of well-trained technicians

and at least one top-rate physicist, but the language difficulty was a barrier to my getting information. It was obvious, however, that the Ph. D. was definitely subordinated and even the younger M. D.'s were without any authority of their own. In Italy this tendency was even more marked. The professor was the bossman and nobody else was allowed to think.

Dr. Mayneord has by far the largest hospital-physicist manufacturing plant in operation, but even his plant cannot turn out a sufficient number to supply the need. He was interested in the plans we are working up for formal training and would be happy to obtain a number of exchange students. His ideas for research projects are without end, and he has one of the few departments where students can receive a complete training. The funds for his department, however, are limited. His interest in any student would be heightened if the student had some research funds attached to him. Dr. Clarkson introduced me to the secretary of the Hospital Physicists Association. They have a few foreign members and would welcome others from the States. If there is to be an active concentration on clinical physics training in the United States, they will offer any help they can give and would welcome the establishment of a sister society or branch of their society in America.

During my talks with many of the English hospital physicists, I outlined some of the conversations with Hoecker, Kerman, and Clark, and the ideas expressed at the TEB executive committee meeting. To my surprise the English hospital physicists were usually of the opinion that a more formal scholastic training was highly desirable, and that a systematic recruitment of new talent is absolutely necessary. The only objections were the concern that a formalized system of attracting students would dry up the present occasional sources of excellent men from the fields of engineering, electronics, and pure physics. There was also some concern that such a course be so specialized as to minimize the importance of the larger field of medical physics. Many of the English hospital physicists were of the opinion that such a scholastic system as the subcommittee No. 6 might propose must almost certainly be organized in Great Britain since they, too, have had troubles with recruitment. The general feeling is that the isotope problems and the diagnostic and therapy problems in X-ray are expanding rapidly and will be capable of supporting a major career for a large number of specialists.

Probably the most interesting and important feeling that I got from the investigation of hospital physics was the persistent mumbling undercurrent of dissatisfaction of the Ph. D. with the tendency for some M. D.'s to adopt an attitude of omniscience. They apparently consider the physicist a high-grade technician rather than a coworker of equal standard. This dissatisfaction was obvious to me even at the highest levels and could easily destroy any program we might develop in America.

VI. VARIOUS MISCELLANEOUS DISCUSSIONS THROUGHOUT THE TRIP

A. Scintillation detector, the Royal Cancer Hospital

Dr. Belcher, physicist at the Royal Cancer Hospital, demonstrated a number of his new clinical scintillation dosimeters and detectors. He is using an anthracene crystal in a polished light pipe of dural metal attached to a photomultiplier tube. The amplified impulses are attached to a simple electrometer system. By this method he has been able to record dose rates of the order of 1 r per hour within a sensitive volume of 1 mm^3 but displacing a somewhat larger volume of phantom material. Attached to the device is an ingenious shutter mechanism that interrupts the optical path and allows for the direct and immediate calibrations of anomalous results due to radiation striking the photomultiplier tube, to dark currents, and to temperature differences. Clinical probes have been designed with a single- or double-sensitive probe on the same photomultiplier tube. For example, when the double probe is placed over a blood vessel and when the impulses are shown on a recording mechanism, it is possible to accurately measure linear flow rates. This device has been used already in such clinical problems as the measurement of portal blood flow. It could and is being extended to many other flow and circulatory studies. The smallness and maneuverability of the single-probe device make it an ideal instrument for thyroid surgery. Belcher's studies are being published shortly and will be well worth detailed study. This is one of the few instrument ideas I saw in Europe which appear to be worth swiping.

B. Scatter radiation measurements at the University of Paris

In France I spent 2 days at the University of Paris, mostly at the Institute Gustave Roussy, which, according to many European observers, is the most isotopically active French outfit. The other centers in Paris have no observable activity and one institute seemed to be actively opposed to the use of any isotope other than radium.

Dr. Tubiana and Dr. Dutriex are doing considerable work with iodine 131. There is nothing unusual except in the way of physical measurements. They have a moderately large laboratory with basic equipment for work with carbon 14, iodine 131, P 32, and gold 198. Very little is being done as yet with gold 198. The carbon 14 work is the usual chemotherapy tagging problem. In the laboratory there is a good iodine 131 loading and diluting device that has been cleverly designed. The P 32 dry box is a routine device. The rest of the laboratory is primitive by our standards but workable. They seem to be applying tremendous amounts of protection, much more than is necessary for the levels of hazards they work with.

Dr. Dutreix has an iodine 131 uptake measuring device that is working well and is giving good results. A large tray is carried by a double tube stand placed over the bed. This tray has four 1.5 cm. lead diaphragms, and positions are set with wooden sticks. The area shielded is considerable and probably adequate with the additional shielding of the Geiger-Muller tube. They are using this machine not only for quantitative iodine 131 pickup studies but also, at a tremendous expense of time and effort, they are using a very small focal spot manually adjusted over the area in an attempt to get multiple-survey type profile measurements. It takes one-half day to get what our scintogram shows to be an inadequate survey. Dr. Dutreix is cognizant of the faults of his equipment and is not being held back by the lack of ideas but rather by lack of time and funds. Drs. Tubiana and Dutreix and a physicist are extremely interested in the measurement of the scatter component of radiation from internal sources. Using wax and water as phantom material, they are working on the buildup of scattered radiation within a polyvinyl right-cylinder phantom. The phantom is kept at a constant temperature by a heating plate that is used both for melting the wax and keeping the temperature roughly constant. There are templates for positioning chambers and sources in various positions inside of the phantom. Radium was being used as the source while I was there; however, iodine and other sources have been used. The measuring devices are small spherical chambers 1 mm. thick and have a 1 mm. open space and a spherical collector inside. They are said to work with considerably greater uniformity than the Baldwin-Farmer chamber. All are standardized against radium.

The problem of the scattered radiation component is being approached primarily by blocking the direct-primary component. In the phantom they place a lead shield shaped to block only the primary rays between the source and the detector. The radiation within the umbra of this shield should be a good direct measure of the scattered radiation. Their preliminary work indicates a surprisingly large buildup of scattered radiation intensity at a distance from the source, and as in keeping with K. Z. Morgan's statements on the I D^2/D plots of intensity around large sources in air and water. The buildup factors seem to be remarkably high and there are many details of technique in the mesaurement which are, in my opinion, open to criticism. Using shielded areas, we have attempted the same type of measurement following an idea of Gray's which appeared in the literature many years ago, and have already made many measurements on isodose lines around sources in various media. It seems worthwhile for us to reconsider the inclusion of the type of measurements adopted by Tubiana's group. There was a considerable discussion on the effect of adding a proportion of higher Z scattering material within the system. Rather than approach the problem the way we are doing it they have built their phantom so that a series of bones can be added as an increased scattering material.

C. Meeting with Dr. Bush on internal dosimetry

On Saturday afternoon Mr. Eastwood of Harwell and I had the opportunity of a conference with Dr. F. W. Bush on the problems of dosimetry from internal sources. Dr. Bush is best known in this country for his theoretical work on the distribution of radiation from various types of sources. He is, however, a practicing diagnostic radiologist and does all of his theoretical radiation physics in his spare time as a hobby. Everybody who knows him has agreed that he is a genius in the mathematics of radiation dosimetry.

Dr. Bush was well acquainted with the faults of the present system of calculating radiation dose but pointed out that before any theoretical determination is possible certain experimental facts are necessary. I described the studies we are attempting in phantoms and he agreed that while these were of immediate practical importance they did not allow for a study of the theoretical patterns from which a theory of dosimetry could be devised. In the course of the discussion we tried to outline what types of phantom measurements would be desirable for a definitive study. In the problem of the isotopes (such as intracavitary gold 198 and other colloids) that absorbed on surfaces we came up with the idea of using a flexible long-line source. This source could be bent into any shape and converted by rotation into a solid of revolution, thus allowing for the study of the radiation around both internal and external shells of various sizes and dimensions. The question of the sodium-benzoate system was also approached. If such a chemical-dosimetry system could be gelled it might be possible to test empirically the distributions of rotating fields. Dr. Bush would very much like to have copies of our data and will attempt an independent analysis of the results. He was also interested in the problem of the deviations of absorption from that predicted by theory in low Z materials common in tissue and would like to participate in the study of whether such differences could account for a portion of the differential radiation sensitivity of tissue.

D. Activities in Zurich

The visit to Switzerland was spent entirely with Dr. Muller, of Zurich. Dr. Muller described his work on the state "O" cancer of the uterus for which he would like to use a beta applicator. Muller has tried to get Tracerlab to design him a strontium applicator but so far has not been successful. It is difficult to see how a strontium applicator could be made to fit into the long thin probe desired by Muller. The use of ruthenium 106 might be far more practical. It might be worthwhile to consider the manufacture of such an applicator.

With the help of very fancy surgical techniques Muller is spending a great deal of time on the mechanical methods of localization of radiocolloids. They are doing such things as introducing the radiocolloids into the cisterna magna, and letting them drain through the spinal canal out through a lumbar puncture. Although the method is tedious and time consuming he thinks it is perfectly safe and has an important, though limited, field of application.

Muller suggested the use of microembolization many years ago and is still working on it. He thinks it gives a far better distribution in such things as irradiation of a lung, but his method of measuring the distribution inside of the body is by the use of external autoradiograms with ordinary X-ray films. This method has almost no resolution and I doubt that a scintiscanner record would confirm his clinical impressions. He is impressed with the excellent distributions of the carbon plus radiogold microemboli given intravenously for localization in the lungs.

The history of Muller's invention of the intracavitary gold technique is an interesting one. Before World War II he spent some time touring America and visiting various centers where there were cyclotrons. During the war he had the Zurich cyclotron available for use and began with the manufacture of a zinc isotope. The early work was done in the spring of 1945 in which he injected a radioactive zinc colloid into a mouse. The first autogram of this intracavitary distribution appeared in print shortly thereafter. So far as Muller knows the original reference to the intraperitoneal application of nonsoluble particles of radioactive material appears in the Muller article in Experentia (vol. 1–6, p. 199, Sept. 15, 1945). The autograms of the mouse shown on page 199 is the first published application of nonsoluble particles in an animal. On page 200 of the same article he shows an autogram of the material, zinc 63, in a patient. He mentions in this same article the possible use of other isotopes that might give a better radiation pattern. In succeeding articles in the same journal in 1946 and 1947, Muller described the injection in the parametrium of a few patients, and apparently was the first to suggest an interstitial use. In his first article he makes the suggestion that the size of the particles are of primary importance. In 1946 he first developed the idea of microembolization in which radioisotopes were given intravenously to get a good localization in the lung.

E. Current activities at Heidelberg University

At Heidelberg University Prof. J. Becker and Dr. K. E. Scheer have probably the most active isotope therapy department that I saw on the Continent. Becker and Scheer have manufactured a number of 6-millimeter beads of cobalt. Each one of these beads is turned out individually on a lathe and has a hole drilled through it. They are irradiated at Harwell to an intensity of 1 or 2 megacycles per bead and then plated to a thickness of about 50 microns of gold after irradiation. To my questions on the permanence of the gold-plating Dr. Scheer demonstrated by sterilizing a gold bead in boiling water and in baths of hydrochloric acid. He has never been able to detect a loss of cobalt 60 through the gold. In spite of this, however, he would rather use a cobalt nickel alloy for the bead, but cannot get the material. The beads are handled with a simple forceps system, are strung on a wire, and pushed through a large trocar, into maxillary sinuses, uteri, and bladders. Radiographs demonstrated excellent and reproducible patterns of the beads within cavities. The dosimetry can be adjusted by interspersing the active beads with inactive aluminum beads. Dr. Scheer has developed a simple cadmium sulfide crystal dosimeter on a rotating table to determine the isodose lines of various patterns of beads. The beads are also used to manufacture plaques on a plastic mass. Since these plaques, however, did not give a satisfactory distribution of radiation, Becker and Scheer are also using powdered cobalt, and mixing it with plastic moulage material. The powder is well distributed within the moulage plastic and the outline of various surface lesions are copied under a piece of cellophane and shaped in depth to make various types of surface applicators. The material is rolled out on a breadboard with wooden spoons and shaped to fit any surface. It is covered with a hydrophilic cellophane covering and strapped into place with adhesive tape. They have never been able to determine a loss of cobalt with this method but they would far rather use a small bead than the powdered cobalt.

In order to get away from the use of the powder, Dr. Scheer has developed a system for making small plexiglass pearls. The powdered cobalt is irradiated to low intensity at Harwell and is placed into a solution of methacrylate. When well mixed the methacrylate solution is placed in a —10° C. water bath, the material is forced out of a small opening into a cold bath of glycerin layered in water. The small droplets form themselves into approximately 2-millimeter pearls, each containing a small amount of cobalt. These pearls are used in various ways. They are either mixed in a plastic moulage material or can be suspended in various liquids. If the liquid has a high specific gravity, the pearls will float on the top and can be positioned inside of a cavity. With low specific gravity they will fall to the bottom or with the correct specific gravity they can be made to distribute themselves throughout the fluid.

Becker and Scheer have investigated the dosimetry around such small plexiglass pearls mixed into various shaped plastic masses. While the isodose lines do not approach the cosine surface theoretically obtainable, they do get cups of radiation that almost approach this ideal. The idea is an excellent one and should be followed up.

Dr. Becker has just completed the construction of a large isotope laboratory, complete with shops, chemistry, physics, storage, and therapy rooms. A 15 mev pendulum therapy betatron is being installed within the next few months. They have space for a cobalt 60 machine in which they would like to have complete freedom of rotation, but do not have sufficient funds to purchase the machine at the present time.

At Heidelberg they are doing the usual work on iodine and phosphorus therapy but on a small scale. Becker and Scheer are specializing primarily in the external source applicators of low specific activity. In their spare time they are editing the world literature on radiotherapy in the journal Zentralblatt für die Gesaurte Radiologie.

F. Cyclotron-produced isotopes from Holland

In the Phillips Technical Review (vols. 12 and 14), there has already been published some details of the Amsterdam synchrocyclotron. Halberstadt gave a short description of the machine as it is being used for the production of carrier-free, cyclotron-produced radioisotopes for clinical use.. He also described some of the separation techniques and their yields and described some of their methods of absolute standardization by measurement of the characteristic X-rays with a specially made Geiger tube. In table 2 is presented a list of the isotopes and the yields that are now being produced in Holland and are ready for distribution.

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Isotope	Half life	Radiation	Target	Nuclear reaction	Yield in μc per μah	Yield per hour in mc
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V-48	16 d	K,$\beta+$,γ	Ti	d,2n	350	10.
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Mn-54	310 d	K,γ	Fe	d,α	5	0.15.
Fe-55	3 y	K	MnCu	d,2n	10	0.3.
Fe-59	47 d	$\beta-$,γ	Co	d,2p	2	0.06.
Co-56 (57)	80 d (270 d)	K,$\beta+$,γ	Fe	d,2n(n)	40 (10)	1.2 (0.3).
Co-58	72 d	K,$\beta+$,γ	Zn	d,2α	0.04	0.0008.
Co-60	5.3 y	$\beta-$,γ	Co	d,p	10	0.3.
Co-60	5.3 y	$\beta-$,γ	Cu	d,pα	0.17	0.0068.
Cu-64	13 h	K,$\beta+$,$\beta-$,γ	Cu	d,p	23,000	920.
Cu-64	13 h	K,$\beta+$,$\beta-$,γ	Zn	d,2p,d,α	1,200	20.
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Br-82	35 h	$\beta-$,γ	KBr, K_2CO_3	d,p	235	4.5.
Rb-86	19 d	$\beta-$,γ	Sr	d,α	20	0.4.
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G. Diamond probe counter

One of the few interesting gadgets that was being demonstrated was a flexible probe counter developed by the Diamond Producers Association (head office, Consolidated Building, Kimberly, South Africa). We were shown a demonstration of the fluorescence of various diamonds under ultraviolet light which allowed the determination of which would and which would not serve as detecting devices for gamma rays. A long, thin, flexible probe counter that they have developed is still considered by them to be an experimental instrument. It is, however, now commercially available. The diamond was an extremely small volume and appeared to be a fine pinpoint counter. It could be liquid sterilized or autoclaved, and used internally. It functions well at room temperature and, they thought, at much higher temperatures. The claim was that good counting diamonds (not all diamonds are good counting diamonds) maintain a steady counting rate for several hours. They also have the usual associated electronic equipment especially adapted for medical use. The idea is an interesting one and it is worth further investigation.

VII. AUTOMATIC SCANNING METHODS

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a planar surface in a rectangular scanning pattern covering an area of about 30 by 30 centimeters. It is so designed that the speed may be increased or decreased. The field size can easily be made much larger or be cut down to a small field of scan. On this mechanical scanning device any sort of detector may be attached. For scanning internal isotope distributions a scintillation crystal is used. They use a different detector for ultrasonic waves. Many other types of detectors are planned. The electrical impulses from the detector mechanism are amplified and are routed through a series of amplifiers and storage tubes and finally displayed on a television screen. Prior to the presentation of the final picture of the complete scan, background and interferring line noise is determined electronically and subtracted from the final picture which has a remarkable resolution and is relatively close to that theoretically obtainable under the best possible conditions. Plans are under way for the adoption of this basic mechanism into a large number of scanning problems. It is theoretically possible to do quantitative scanning, although this has not yet been attempted. The limitation of the areas of scanning by the use of visible light beams can be superimposed and will be in the future. One of the immediately practical improvements of the device is the attachment of a siamese twin moving container underneath the patient. On this container there would be placed a radioisotope source of any particular energy desired. The present plan is to use thulium with an 85 kev energy. A combined collimated low-energy source and a collimated scintillation detector will yield a high degree of resolution. Such a device reopens the field of diagnostic roentgenology with radioisotopes. The machine, except for a few minor bugs, is almost ready for routine operation and will, I believe, outclass and throw every other piece of scanning equipment out of date.

VIII. PAPERS REPORTED ON THE USE OF RADIOACTIVE ISOTOPES

E. A. Jochin, of London, presented his impressions on the response of thyroid carcinoma to radioiodine treatment based upon a series of about 20 patients. He felt that one of the most important problems was that of measuring the response of the thyroid carcinoma to the treatment. He outlined his impressions of a number of methods of determining this response: (1) He thought serial biopsies were rarely justifiable. (2) He felt that local edema and tenderness of a gland shows evidence of iodine uptake rather than of radiation change. (3) He felt that the reduction in the size of the metastases as determined by any available method, although a measure of effect, did not give an indication of residual function. (4) He felt that the decrease in the rate of thyroxin formation was shown by a progressive lowering of the protein bound radioiodine concentration developing after successive test doses. (5) It was his feeling that the most useful measurements of response to treatments may be made by a profile counting method. He believes that the external counting procedures often showed that the turnover of radioiodine in a carcinoma may be faster during the therapeutic dose than during the preceding test dose. He felt that this indicated a radiation effect. Pochin felt that the aim in the treatment of his cases has been to reduce the total tumor uptake of radioiodine below 0.5 percent of the test dose.

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needed retreatment, and 2 percent had permanent myxedema. They had the feeling that after thiouracil preparation, radioiodine was picked up and retained by the thyroid gland much longer, there was less variability in the percent pickup, clinical relief was much quicker, and that many of the patients could be treated entirely as out patients without radiation hazard.

Pahaut and Govaerts (Liege, Belgium) presented a system of following the course of the patient on the basis of urinary excretion studies.

In talks with many other clinics using radioiodine in France, Germany, Italy, Sweden, and England, I found no outstanding new developments or problems that lems that are not already under investigation in this country.

In the use of P 32, Low-Beer (San Francisco) presented an excellent summary of the phosphorus 32 problem. His paper is to be published soon and will be given in the medical course at ORINS next month.

Perussia (Milan, Italy) discussed the results of experimental work on the interpretation of distribution patterns in plasma, blood cells, and a few selective tissues of P 32 following intravenous administration. While the methods and experimental results have been presented many times in the literature, they have attempted to present a simplified theoretical system of the dynamics of phosphorus before it reaches the steady state.

A paper was presented by Christiansen (Denmark) on the treatment of polycythemia vera with P 32. Nothing unusual was brought out.

Using red cells labeled with P 32, Bohr (Denmark) has determined the blood volume in patients with polycythemia vera before and after treatment with P 32. He found that in patients with polycythemia vera the red blood corpuscular volume is raised whereas the plasma volume remains approximately normal. He also felt that there was a definite relation between the red blood corpuscular volume and the hematocrit.

Graul (Munster, Germany) described an intercutaneous injection method with P 32 to measure the circulation of the skin.

Jones and Rotblat (London) investigated the fate of radioactive phosphorus injected as phosphate into pleural spaces containing effusions caused by metastatic tumors. They found that a large proportion of radioactive phosphorus was being taken up directly by the metastases. On analysis of the distribution of P 32 activity they found a depletion from the effusion first of all by a rapid uptake into some component other than blood followed by a slower turnover into the blood. They felt that their evidence of neoplastic uptake and that the concentration of P 32 in the metastases appeared to be sufficiently high to justify therapeutic application.

Hahn (Nashville) presented his material on silver-coated radioactive gold colloids for the treatment of broncheogenic carcinoma. The silver-coated gold colloid is administered by the intrapulmonary route through a bronchoscope. Hahn found that the colloid is rapidly removed from the lung parenchyma and appears in considerable proportion in the lymph nodes draining the lung region. While it is well known from many previous studies that this will occur in normal dogs there is some question that the lymphatic uptake could be repeated in a patient with a tumor-laden lymphatic system.

Poppe (Gottingen) presented some of the theoretical advantages of the interstitial injection of radiogold. In 24 patients, in which radioactive gold was infiltrated into carcinoma of the tongue, they had 21 excellent results after 1 year.

Scheer (Heidelberg) described an interstitial use of radioactive phosphorus similar to the techniques used with gold and following the chromic phosphate idea in this country. Scheer used magnesium ammonium phosphate in an isotonic colloidal suspension. Like all of the suggestions that are coming out of Heidelberg, this technique seems well worth further consideration.

Muller, of Switzerland, presented work with intraperitoneal and intrapleural zinc 63 and gold 198. He gave the entire history of his discovery of the possibility of doing intracavitary therapy with radioactive colloids starting as far back as 1945.

Wuerff (Nijmegen, Holland) presented his work with synchrocyclotron produced gallium 66 and gallium 67 isotopes. He has repeated some of Dudley's work with gallium 72. Most of his preliminary results are a confirmation of our report a year and a half ago in Chicago.

Pahaut (Liege) described the use of strontium 89 in bone tumors. The distributions of radiation which they demonstrated were not at all impressive.

Lajtha (Oxford) reported some careful work on the uptake of S 35 sulfate by human bone marrow cells in vitro. In human bone marrow cultures, autoradio-

graphs have shown that large amounts of sulfur 35 sulfate are taken up by the cytoplasm of early myeloid cells only. Polymorphonuclears and leukocytes showed little or no uptake; nucleated red cells never showed an uptake. He felt that S 35 sulfate in the cytoplasm of the early myeloid cells exists in an inorganic form not soluable in water or the other usual solvents but is removed by normal hydrochloric acid and solutions of sodium hydroxide. He found that the S 35 sulfate was not removable by hyaluronidase. The uptake appeared to be inhibited by barbiturates but not by X-irradiation. He felt that the results suggest a relationship with the sulfur containing polysaccharids and indicate a hitherto unknown function of early myeloid cells.

Roswit and Wisham (New York) described their now well known skin radiosodium clearance studies. They have applied these studies to irradiated skin and feel that the changes due to radiation must be the result of direct impact of radiation on the individual epidermal cells and not to an impairment of their vascular supply. They feel that within the range of present therapeutic dose levels the effect of blood flow to irradiated tissues in tumors as well cannot be altered.

Lassen and Munck (Copenhagen) described the Kety method of determining cerebral blood flow following inhalation of nitrous oxide. Since the exact determination of the nitrous oxide concentration is difficult and time wasting, they used radioactive krypton and took multiple samples of arterial and venous blood.

Walton (London) described some of his experiments on the effect of an electric current in producing movement of associated ions through artificial media and tissues. It is his opinion that some such technique might be applied to the treatment of malignant disease. The future development of this idea should be interesting.

Millen (Belfast, Ireland) described the use of a central radiation source in intracavitary irradiation of bladder tumors. A thin stainless steel catheter was manufactured with a latex balloon on the tip. With the balloon empty the catherer could be passed easily through the male urethra. After insertion the balloon is distended (with a solution of sodium iodide and a dye) to a volume of 150 to 250 milliliters. The shape of the balloon is checked radiographically and, when correctly positioned, a 100 to 150 millicurie small source of cobalt 60 is inserted into the stainless steel catherer and positioned in the center of the bladder. He felt that technique was suitable for the treatment of only the superficial types of bladder tumor, and should not be applied to the treatment of infiltrating growths.

Green (London) described the use of radiactive tantalum wire for implantation and intracavitary irradiation of corpus uterine cancer. Tantalum was irradiated to an activity equivalent to 1 milligram per centimeter of radium in a wire of thickness under 1 millimeter in diameter. The wire was plated with 0.1 millimeter of platinum to filter beta particles and provided a flexible source much thinner than radon seeds but used for much the same type of purpose. Small cannulae are used to introduce wires. Both Smithers and Sinclair have reported elsewhere the same type of use of tantalum wire for the use in bladder lesions. Green also described other uses of tantalum 182 in combination with various kinds of applicators for treating concer of the uterus.

Kottmeier (Stockholm) presented a general paper on the modern trends in treatment of cancer of the cervix. It was his feeling that radiotherapy should be the primary treatment in every case of invasive carcinoma and surgery should be limited to radioresistant cases. Patterson (Manchester) had just previously spoken on the same subject and seemed to have the same feeling on the relative value of radiation and surgery. On the other hand, Patterson was preceded by Brunschwig (New York) who leaned somewhat in the other direction. Kottmeier made some remarkable statements among which was his feeling that a fixed cancer dosage does not exist nor is there an equivalence in the radiation effect of the tumor cells to the calculated dose in gamma or roentgen tissue dosage. It is likely, according to Kottmeier, that the peripheral part of a growing carcinoma does not need such a heavy dose as the central part. He gave no evidence to support this contention. He felt that the combination of radium and rotational X-ray therapy was of great value in selected cases.

Lamerton (London) described comparisons between the effect of uniform whole body X-irradiation and of nonuniform irradiation achieved either by shielding parts of the body during external irradiation or by administration of various radioactive isotopes which are preferentially localized in various sites in the body.

IX. HIGH-ENERGY ACCELERATORS

One of the intense fields of concentration is on the problem of high-voltage particle accelerators. Howard-Flanders (London) described the recent work at the Hammersmith Hospital where an 8 mev. linear accelerator has been built especially for clinical use. Another 13 mev. machine is partly constructed and a 4 mev. linear accelerator has been designed to be moved in an arc around the patient. Howard-Flanders is concerned about the problem of integral dose and feels that this is one of the major arguments in favor of the high-energy machines.

Grivet (Paris) discussed a 4 mev. electron accelerator. Gund (Erlangen) talked about the new Seimens medical betatron. This is a 15 mev. machine which is compact, has a high output, and is suspended so that it can perform pendulum therapy. Weideroe (Switzerland) described a 31 mev. Brown-Boveri betatron and its adaptation to radiotherapy. Schubert and Paul (Hamburg) discussed some of the basic problems of using fast electrons from a 6 mev. betatron.

Mitchell and his group (Cambridge) presented the development of a 30 mev. syncrotron as a radiotherapeutic instrument. A large amount of therapeutic physics has already been accomplished with this machine and clinical trials are well underway. Mitchell also stresses the substantial reduction of the integral dose in the radical treatment of otherwise inaccessible tumors. He points out, however, a great disadvantage in the clinical estimation of maximum tissue reaction since the reaction occurs at a depth where it can not be seen by the therapist. He also admitted the mechanical difficulty of keeping the machine running. (For example, when I visited Cambridge the machine was temporarily out of operation.)

Joyet (Zurich) described and discussed the problem of the induced activities in tissue from radiation with the 31 mev. Zurich betatron. There was also a discussion by the Zurich bettaron group on the very difficult problem of physical and biological dosage at 32 mev. energies. Wood and Newberry (London) presented the techniques being used with the 8 mev. linear accelerator at the Hammersmith Hospital. Bloomfield (Sheffield) talked on the Sheffield National Center's 2 million volt Van der Graff and the results on the first 3 years experience and 1,200 patients. The largest portions of their experience has been with intracranial tumors, carcinoma of the mouth, larynx, esophagus, bronchus and lungs, rectum, bladder, and cervix, and a number of patients treated for artificial menopause. They were enthusiastic about the results but again stressed the point that Mitchell made on the reactions which are out of sight but cannot be neglected.

Uhlmann (Chicago) discussed some of the theoretical problems in the use of fast electrons from the 20-million-electron-volt betatron. Birge (Berkeley) presented the biological research being done with the 190-million-electron-volt deuteron beam and the problems that will come up with the use of the machine in human beings. Human application of this machine, however, is not anticipated for some time. A contribution by Schubert and Hohne (Hamburg) was on the genetic research they are doing with their 6-million-electron-volt betatron. Newbery (Harrow) spoke on some of the physical measurements that were made on the 8-million-electron-volt linear accelerator at Hammersmith Hospital. Bewley presented the techniques and measurements and the isodose charts measured with a water phantom with the Hammersmith 8-million-electron-volt accelerator. Motz and Wyckoff (NBS, United States of America), described their precise work on the measurement of the million-volt X-ray spectrum and a number of the new methods that have been developed at the National Bureau of Standards for application to other machines with other energies. Braams (Utrecht) offered a number of absorption and scattering measurements made on the Cambridge 30-million-electron-volt cyclotron. He gave serious criticism of the current method of deriving absorption coefficients from depth dose curves. The essence of Braams' criticism is found in K. Z. Morgan's papers and implies the same problem of scattered radiation buildup previously brought up by Tubiana's group in Paris and by many others who have considered the extended source problem. A beam of external energy can in this sense be considered an extended source.

Wheatley (London) discussed the correlation between energy flux in ergs per square centimeter and the dose in roentgens. The effect of the spectral distribution of radiation, especially in the supervoltage range, makes necessary certain corrections for absorption by the process of photodisintegration. Wheatley discussed a number of experimental measuring tools, including a microcalorimeter within an insulated absorber. If the new "rad" unit of ergs per gram is to be

used as a unit of energy absorption, Wheatley's methods are worthy of careful review.

Laughlin (New York) and his group discussed the problems of dosimetry of high energies. They have measured the specific ionization from high-energy electrons from 10 million electron-volts to 22 million electron-volts in air and related this to the problems of dosage in tissue.

Kelliher (England) described a 15-million-electron-volt linear accelerator used as a source for supervoltage X-rays which gave an output of over 2,000 r/min 1 meter from the target. A clinical machine has been made in which the X-ray head is rotatable through a 135° of arc. There are full facilities for varying the size of the field. The New York and Chicago group discussed the use of high-energy electron beams from 2 to 22 million electron-volts. The problems of the extraction of the electron beam from the betatron and the absolute energy and some of the measurement problems were discussed.

Miller (Manchester) described some of the problems in the design of linear accelerators for X-ray therapy.

Van Dorsten (Eindhoven) described a deuteron accelerator which he felt could produce a fast neutron flux of 10^{10} neutrons per second originating from a D–D reaction. The present machine has almost reached this desired figure, and it was his opinion that this fast neutron beam would be of ultimate value in therapeutic research.

Munson (Harwell) described some of his current measurments with a homogenous ionization chamber of atomic composition C–H. The ionization due to slow neutrons and gamma rays accompanying the fast neutrons were determined by simultaneous measurements with chambers filled with boron, trichloride, and argon. He reviewed the recent experimental evidence concerning the dependence upon speed of the ionizing efficiency of charged particles in gases and its effect upon dosage calculation.

Simons (London) presented a series of measurements of the total absorption coefficient for slow neutrons of both an artificial tissue and some simpler hydrocarbons.

X. RADIATION PROTECTION LEGISLATION

One of the most important of the general meetings held at the congress was the meeting on the state control of protection against ionizing radiation. Lauriston Taylor, of Washington, D. C., presented a complete summary of the legal philosophies within many different countries concerning radiation-protection control. In his summary he showed that the systems of rules, licenses, and regulations ran all the way from the system followed in the United States with no national laws or licensing system and where control is based upon voluntary compliance with the National Committee on Radiation Protection recommendations, to the very formal and detailed code followed in New Zealand. He also summarized the reasons why strict police power was almost theoretically impossible and pointed out where abuses of and the privilege of using radiation could easily occur. Dr. Taylor's remarks have been distributed in mimeograph form to the members of the National Committee on Radiation Protection and will presumably be published for general distribution in the near future. It is a necessary piece of reading matter for anyone who is using radiation.

Dr. Zakobsky (Vienna) followed Dr. Taylor with a statement which seemed to stress the need for a stricter state control and policing system of radiation usage. He described the system now in use in Austria. He did, however, point out the necessity for any single state system of regulations to follow a set of recommendations agreed to by all nations. He seemed to feel that some organizations, such as the World Health Organization, should take up the problem.

Dr. Sievert, of Stockholm, presented a statement on the informal regulation system which is being followed in Sweden. Radiation-protection problems in the Swedish regulations are generally defined with a recognition of the lack of fundamental information on the questions of where protection is necessary, where the threshold dose biological action passes from a less to a more harmful stage, the definitions of measuring tools, etc. Dr. Sievert pointed out the necessity for more reesarch in radiophysics, radiobilology, and radiomedicine. Such research would allow us to continue practical radiation protection and still leave room for changing ideas as the knowledge of the fundamentals of radiation hazards progresses.

At a different session of the meeting Dr. Roth, of New Zealand, described the Radioactive Substances Act of 1949 of the New Zealand House of Represent-

atives. He described the definition and operation of a strict radiation protection legislation and his impressions of its success over the past few years.

The CHAIRMAN. Are there any questions, gentlemen?

During the testimony of Dr. Brucer and the testimony of others who have preceded him, and I am sure the same will be true of those who will follow, I have been deeply impressed with the character of service that is being rendered.

In the first instance, the average person looks upon the Atomic Energy Commission as an organization set up to advance the cause of security by the use and development of weapons that kill. However, the testimony this morning with respect to this department or Division of Biology and Medicine of the Atomic Energy Commission indicates that a great service is being rendered to the people of this Nation, and ultimately to the world, by the research work that is being carried on, not to kill but to preserve life.

It seems almost paradoxical that there could be these different aspects, and it is extremely gratifying as I have listened this morning to realize that men of your standing and your ability and of your interest are engaged in making a study of this kind, taking what probably in the public mind, at least, is considered a death-dealing agency and making out of it a life-preserving agency.

I have been further impressed this morning by the fact that you give attention to the lost cases—the cases of cancer that too frequently are sent back home to die because there is no remedy and there is no help and there are not sufficient beds, there is not sufficient medical assistance to care for them, but you people are giving your attention to cases of that type. You are taking the hard part of the problem to work upon, and as a Member of Congress, and I know that I express the feeling that exists with other Members, it is highly pleasing and gratifying to realize that in our Government there are those agencies that are working for the common good and to promote the welfare of the people; that their whole time and whole attention and our whole expenditure is not merely to devise better and more effectual means of killing as a source of security, but that emphasis is being placed upon promoting the welfare of our people, by improving their health.

We are deeply appreciative today for the appearance of you gentlemen as a panel before us to inform us, and I trust through us to inform the people generally, of the fine work that is being done and which gives such great promise for the future.

You have inspired us with the inspiration and the spirit that I am sure each of you possesses as you carry on this splendid work, when, if you so desire, your talents could be probably used in a more lucrative way by giving of your time and your talents and your ability in this work that you are carrying on, and which I trust will always continue to be an inspiration to you, and that it will likewise create interest upon the part of others who will be helpful in this great matter of promoting the health of our people.

Doctor, I should not have said all that, but it was in my heart and mind to say it, and I want you to proceed with the balance of the hearing.

Dr. BUGHER. Thank you, sir.

The CHAIRMAN. Are there any questions? Mr. Dolliver has a question.

Mr. DOLLIVER. Dr. Brucer, I want to inquire about a matter that Mr. Teeter called to my attention and that is this: The development of the technique of rotational radiation—is that a proper term?

Dr. BRUCER. Yes, sir, that is a good term.

Mr. DOLLIVER. Would you explain that to us and tell us its advantages?

Dr. BRUCER. One of the first men to use radiation in therapy was an Englishman named Dr. Knox in London, England, at the Royal Cancer Hospital. This was in 1906. The first way he tried to use his machine was by rotating the machine over the patient. But he had trouble in doing that because in 1906 the energy X-ray that he was using was very low, and therefore he could not get sufficient penetration into the body. Also, in order to get the low energy which he was getting, he had to have tremendous electrical cables coming to the machine and therefore he could not rotate the machine. So there was a mechanical difficulty, which was an energy difficulty, in 1906.

During the history of the development of X-ray therapy throughout the next some fifty-odd years there has been an increase in the energy every year or so and there has been such an increase in the amount of energy until we finally came to 1940 and the advent of that area where we now have 1-million-volt energy, and so forth. But with the development of the X-ray machine, as the energy went up, the machine became larger and larger and became impossible to move around with, with complete freedom.

With the development of isotopes, within a period of a few years, we have truly high-energy radiation, but at the same time we have it self-contained in a source which is no larger than the end of this pen. Now, we do not have the large cables, so that we do now have a complete freedom of rotating the machine. It is not the large, bulky thing that used to be in the 3-story, 2-million-volt X-ray machine, because I think for the first time we can start to study what is no longer termed rotation therapy. We have changed that; we do not want to just rotate the machine; now we want to have what we call moving-field therapy because we are going to make the machine, or move the machine over the patient in any direction so we can develop what Robert Knox was trying to do in 1906—to develop an area of concentrated radiation inside the body, no matter where it may be inside the body.

Mr. DOLLIVER. Is there not also a technique that might be called a crossfire therapy—where you direct two beams at a certain spot in the body?

Dr. BRUCER. This is the technique that is now used, and of course it is much the same type of technique to develop a concentration of radiation inside the body. If you use 2-beam crossfire, the crossfire area will have a much greater absorption of energy than with 1 beam; if you use 4 beams that is even better; if you integrate this over an infinite number of beams on a rotating system, then you have got as good as it is possible to get—then you have approached the 1-million area, or as far as radiation can go.

Mr. DOLLIVER. You get the maximum benefit?

Dr. BRUCER. Yes, sir, you are getting the maximum benefit then.

Mr. DOLLIVER. Well, is that rotational or crossfire technique generally used at the present time, or is it still in the experimental stage?

Dr. BRUCER. To a large extent it is still in the experimental stage, but there are a number of people in the country who have started to approach it. Within the last 10 or 15 years it has been slowly growing.

Mr. DOLLIVER. Is that being worked upon by you and the Oak Ridge Institute to any extent?

Dr. BRUCER. On the smaller machine this is impossible, but on the large machine we have done some work. The new machine is being made so it has a complete fredom of rotation.

Mr. DOLLIVER. Do you anticipate that there will be further development in this technique?

Dr. BRUCER. There is a very rapid development going on throughout the world right now in these techniques.

Mr. DOLLIVER. Thank you.

Dr. BUGHER. Mr. Chairman, may I introduce a little change in our program at this moment with your permission, because Dr. Warren has to catch a plane back to Boston at 1:20, in order to make an address in Boston, and I would like to have him address his remarks at this time, to follow later with the discussion of the Chicago Cancer Research Hospital and then further questions.

The CHAIRMAN. Very well. I think Mr. Carlyle had one question which he desired to ask of the witness who has just spoken.

Mr. CARLYLE. It might require some time, though, to answer that question and I shall be glad to delay it.

The CHAIRMAN. I have in mind as we are approaching the end, I presume, of the testimony to be offered, that it would probably be more convenient for everyone concerned if we continued until we finished, rather than adjourn at this time, as we usually do.

Very well, you may proceed.

Dr. BUGHER. Dr. Warren as you know has been one of the greatest contributors to the advancement of knowledge in the field of cancer in the United States. He has been the initiator of many of the developments in the atomic-energy field and is, more than any other single individual, responsible for the program which we are discussing today.

I have requested that he give us his opinions and advice relative to the directions which our research should follow and the trends which exist, as he can see them, based on what we know today.

Dr. Warren.

STATEMENT OF DR. SHIELDS WARREN, DIRECTOR, CANCER RESEARCH INSTITUTE, NEW ENGLAND DEACONESS HOSPITAL, BOSTON, MASS.—Resumed

Dr. WARREN. The advent of atomic energy offered to cancer research workers an almost boundless horizon, both as regards sources of radiation for treatment, and tools for research and the understanding of some of the fundamental aspects of the cancer problem, which is very closely linked with the problem of life itself.

Cancer is an abnormal growth in cells, as you heard yesterday. We had been able prior to the availability of radioisotopes to estimate what cells were doing by seeing some of the raw materials that went into the cells—seeing something of their form and shape under the microscope—and learning some of the end products that came from the activity of these cells.

With the availability of the radioisotopes—which means that every atom—every molecule can be followed in its course through the cell, it became possible to learn a great deal of basic information in the field of how cells grow, how they are put together and the nutritional material that is brought to them—into the cells, into tissue and into organs, and under abnormal circumstances into the cancers of those organs.

The problem of growth and the problem of cancer, as you heard yesterday, is very intimately related one with the other, and the most potent tool that has ever been found for the understanding of growth and production, both normal and cancerous, is this group of radioisotopes—the tagged atoms—which enable us to follow all of the processes that take place.

Now, radiation is like fire. Fire is absolutely essential to us; without it, we would be cold, our food would be raw, but, like fire also, it is a potentially dangerous thing, and uncontrolled radiation, either in the course of the operation of an atomic pile or in the explosion of an atomic bomb, can be even more destructive than a fire. So that a great portion of the effort of the Division of Biology and Medicine has been concerned with keeping the atomic energy business safe, as well as making available the numerous tools that it provides for research in the life sciences.

Just as an example of the safety that has been brought about, I myself have had the unfortunate task of diagnosing and recommending treatment for all but one of the pioneer workers with X-ray in the New England area who, because they did not realize the danger of radiation, had cancers develop on the exposed portions of their bodies, more particularly their hands.

That sort of thing cannot happen now because of the greater understanding of radiation that has been brought about and because we have learned to control it much more effectively than in the past.

Up until the time of the development of atomic energy—the existence of the Manhattan project and the Atomic Energy Commission—approximately 1 out of every 10 people who worked with radium was damaged by that radium. As you know, we have had a startlingly fine accident rate in the Atomic Energy Commission and in the Manhattan District. There have been only two deaths among the thousands of people involved; there have been only a handful of slight injuries, this in spite of the fact that, instead of handling roughly a pound of radium which was the case up to about 1940, the equivalent of literally hundreds or even thousands of tons of radioactive material have been handled by the workers in the Atomic Energy Commission.

I think it is worthwhile showing that industrial safety can be achieved if one knows how to go after it and one does go after it.

The Atomic Energy Commission today is one of the safest businesses, instead of being one of the ones that might have carried an enormous risk.

Now, cancer is a group of diseases and not any one disease. It behaves differently according to the cells from which it arises; it behaves differently with the different sites in the body in which it occurs. I doubt very much that there is ever or there will ever be found one single cause for cancer. In fact, we know already that there are a number of causes and some causes we do not know. I doubt very much that there will ever be one cure for cancer, and I feel certain

that in the applications of atomic energy to the problem, we will find ways of curing certain types of cancer but not all. But, the fact that we can at the present time ameliorate, that we can at the present time actually cure certain types of cancer, makes the picture very hopeful for the future and makes it very worthwhile to keep working in this field.

Now, we have a variety of tools, as Dr. Bugher told you earlier. We have these four different types of radiation which can be applied, each having particular characteristics and each particular ways in which it can be utilized.

The ultimate effect on the cell of all these types of ionizing radiation is essentially the same and the variations we have is in the ways that it can be applied, whether externally or internally—whether certain tissue will pick up one isotope or another isotope, and the essence of the problem of radiation therapy is how to get the maximum damage into the cancerous tissue with the minimum damage to the normal tissue. One cannot radiate without some damage to the adjacent normal tissue, just as a surgeon when he operates has to leave a scar, so the radiologist, when he works, has to leave a scar showing where the cancer has been destroyed and where some of the normal tissue immediately adjacent to the cancer has been also destroyed by radiation.

One of the great problems in the treatment of cancer is that its outlines cannot be sharply defined, and one always has to assume that it extends further than the obvious portions of it. It is somewhat comparable to the problem of the iceberg, the great bulk of which may be submerged.

In the use of radiation treatment, we always need to apply the treatment to a larger field than the obvious field that is shown. For that reason, some degree of selectivity between the sensitiveness of normal tissue and the tumor tissue is of great importance. Fortunately, rapidly growing cells such as we have in many types of cancer are much more susceptible to radiation injury than are normal cells, and this is what gives radiation its advantage—that one can selectively hit certain types of malignant cells without doing too great an amount of damage to the adjacent normal cells.

It is very important in a research program such as that of the Atomic Energy Commission to see that there is a prompt dissemination of the knowledge so that other groups of physicians can make use of it for the benefit of cancer sufferers widely. It is all important that training should continually go on so that there are ample skilled people who know how to do this work in the event that it suddenly becomes of large-scale importance. The training both in the national laboratories and in the universities and research institutions where radiation work is going on is an integral part of the total program in this field.

Also, atomic energy is not a monopoly of the Atomic Energy Commission. We do not feel that only those people who wear the AEC label should work with these materials, and we are very happy to train people in other agencies of the Government and in the various professions throughout the country in the utilization of these materials.

You probably know that at the great new National Institutes of Health, that is being built at Bethesda, there is a special wing for iso-

tope therapy so that patients there will have the benefit of new advances that have been made.

We keep in careful touch with the cancer program, both of the United States Public Health Service and those of the various private agencies; that of the the American Cancer Society, of the Damon Runyon Fund and others, as well as the work that is going on at the various universities, and we hope that we are carrying out the instructions given us initially by Congress and to concern ourselves with those aspects of the atomic-energy problem that will be of benefit to the cancer sufferer, without any inefficient wastage or duplication of effort that is being carried on by institutions.

We feel that we can initiate certain things and tell whether they are good and whether they are not good. If it is good, show others how to do it and make it possible for them to apply such finds on a laboratory scale and we can then continue on with the unsolved portions of the problem with the special facilities that are available at the Atomic Energy Commission laboratories.

Thank you, sir.

The CHAIRMAN. We certainly thank you, Doctor. I was beginning to be a bit nervous over the fact that it is now a quarter of 1 and your plane leaves at 1:20.

Dr. WARREN. If I may be excused, then, sir, I would appreciate it.

The CHAIRMAN. We certainly are indebted to you for your presence here today. We probably would have asked some questions—either Mr. Dolliver or someone else—but recognizing the necessity of your going and going fast we will forego that and try to study your testimony and see whether that will inform us without further questioning of you.

Dr. WARREN. Thank you, sir.

The CHAIRMAN. You have such a reservoir of information and knowledge that we hate to see anybody get away from us who could give so much to us.

Dr. WARREN. I, myself, am very sorry, sir. This is an overriding thing that I could not very well change.

The CHAIRMAN. Surely. Will some member of the staff go with the doctor to make sure he gets quick transportation?

Dr. BUGHER. May we proceed, sir?

The CHAIRMAN. Yes.

Mr. CARLYLE. I would like to ask any member of the panel just one question.

The CHAIRMAN. Go ahead.

Mr. CARLYLE. As I recall, this committee was told yesterday that there were more different kinds of cancer known to the human body than all other diseases of the body combined. Now, the question that I have in mind is this: How many diseases of the human body other than cancer are being studied and considered at this time in the hope that this new radiation would be useful in treating those diseases?

Dr. BUGHER. Well, the list is very formidable. Offhand, I would not be able to give you numbers. But in the general medical program which is being carried on by the general support of the Commission there are explorations into nearly all of the types of disease, if not into every disease. As a good example of the thing that we mean here, some of our disturbances may be related to things that invade the body

from outside, as in the case of infections, viruses, bacteria, and the like; but other ills arise from the fact that the germ plasm itself carries certain potentialities for difficulty, and we know those are called hereditary factors, usually broken up as genetic. For example, color blindness and things of that sort.

So that our concern is very great here. It so happens that radiation may not only damage the tissues of the individual himself, but radiation may also alter the chromosomes of the germ cells of the individual, so that not the individual himself but his children show disturbances and anomalies of an inherited character.

The effect of radiation is to increase the frequency with which such things occur. It generally does not mean something new in the way of disease, but an increase in the frequency of certain diseases of this kind.

Consequently, in Japan a great deal of the program there is concerned with the detection of any evidence of abnormality of the children of people who were in Hiroshima and Nagasaki at the time of those two bombs. It is the largest single effort in the study of human genetics that has ever been attempted. It is part of that program, but it is a very large part of it.

We find that radiation producing such genetic changes may produce changes that are beneficial, particularly in agriculture, so we are working with those things as well.

We prosecute studies of the relationship of the susceptibility to infection and prior or concomitant exposure to radiation. The possible relationship of radiation and the failure of the individual to defend himself against infection constitutes another class of thinking.

So that although I cannot give you numbers of diseases which get involved here, I think we can say that there is no province of human ill in which some work is not going on in this general program, even the area of psychology.

Mr. CARLYLE. Doctor, let me ask you this: Is it generally thought that this new radiation will be of assistance in treating most of the known kinds of cancer?

Dr. BUGHER. Most of the known kinds of cancer? Yes; I think we can anticipate that there are applications of radiation that can be developed to every known kind of cancer, but that does not mean to imply that we have those applications in workable form today.

Mr. CARLYLE. I believe that is all, Mr. Chairman.

The CHAIRMAN. Mr. Dolliver?

Mr. DOLLIVER. I was interested in what you had to say about the effect of radiation on the chromosomes and genetics. Have there been any conclusions drawn from the studies made at Hiroshima and Nagasaki?

Dr. BUGHER. The genetics data from the Japanese is not yet complete enough to give us a firm basis for conclusion. We have just had the benefit of a study of that data by a panel of geneticists in this country, and a similar study will be done by Japanese geneticists.

Generally speaking, there seem to be some effects on such things as the sex ratio, a little shift in the proportion of males and females, as one type of thing that seems to be there. The effects have not been by any means dramatic. The most precise statistical work is required in order to show that there has been some change at all in the progeny of the exposed parents.

Mr. DOLLIVER. Is there experimental data available with respect to genetics as to changes in the lower animals?

Dr. BUGHER. Yes, we have a very great amount of work that is going on. In fact, I believe it is true that about one-half of the total research in genetics in this country is being supported by this general atomic energy program.

Mr. DOLLIVER. Has there been anything published in that field?

Dr. BUGHER. Yes, there is growing literature. During this spring in the bomb tests at Nevada we had a very large program dealing with bomb effects on lower forms of life in the genetics field, involving plants, bacteria, small animals, and the like. That work is going on actually all over the country at the present time. It is all funneled out from the Nevada tests.

Mr. DOLLIVER. I presume the results of those tests and that information will be available to the public?

Dr. BUGHER. Yes, sir; we plan to declassify all those experimental results and they will be published in just the normal way. The only cause of delay, actually, is the fact that it takes 1 or 2 years for the geneticists to get the results of their experiments.

Mr. DOLLIVER. That would be true, I presume, of both animals and plants?

Dr. BUGHER. Yes.

Mr. DOLLIVER. So we cannot anticipate any conclusions from the geneticists until, say, 1956?

Dr. BUGHER. Well, actually some parts of it will be appearing rather soon. Some of the results with fruitflies, for example, can come out rather soon. Final results for animals such as mice require about 2 years; in other words, for the animal to have lived at least a major part of his life span.

Mr. DOLLIVER. They had some swine out there and some sheep and some other animals, as I seem to remember from the press.

Dr. BUGHER. Yes. The genetic experiments, though, did not deal with those. They were used for some other radiation subjects.

Mr. DOLLIVER. Thank you.

The CHAIRMAN. Any further questions, gentlemen?

Mr. ROBERTS. Mr. Chairman, I would like to ask a question.

The CHAIRMAN. Mr. Roberts.

Mr. ROBERTS. Doctor, I believe you testified that this program in which the Atomic Energy Commission is engaged costs the United States Government about $3 million a year; that is, the research phase of it.

Dr. BUGHER. Of the cancer program?

Mr. ROBERTS. The cancer program.

Dr. BUGHER. Yes.

Mr. ROBERTS. I have some figures here from the Department of Agriculture. In the fiscal year 1952 that Department spent about $32 million for the control and eradication of the foot-and-mouth disease.

I also have some figures that the American people yearly spend about $7 million for dog and pet medicaments. That was in 1951. The information is that we spent $17 million for nail polish and enamel; $23½ million for playing cards; we spent over $9½ billion for alcoholic beverages; over $5 billion for tobacco products; almost $4

billion for doctors and dentists; $641 million for taxicab fares and tips; $222 million for athletic and social clubs. Here is a good one: $30 million for hunting-dog purchase and training and sports-guide service.

Does it not strike you as rather odd that we are only spending $3 million for cancer research; that is, in the Atomic Energy Commission; and we know that there are 25 million people living today who will probably die with cancer unless we eradicate it or improve in our techniques of handling it? Does that not strike you as a rather odd situation?

Dr. BUGHER. Yes. One cannot rationalize these behavior patterns of man. It is an astounding thing when you put the figures of what we actually do in line with what we should do.

Mr. ROBERTS. Approximately what did it cost us to split the atom? Was it not about $2 billion?

Dr. BUGHER. You mean the development of the first bomb? Approximately that, yes. It was well over $1 billion in capital investment in the Manhattan district, and about that much more in operations. Part of that was capital investment, which we still have.

Mr. ROBERTS. And about how many years did it take us to do that?

Dr. BUGHER. The first fission was recognized in 1939. The Manhattan program began moving in the early 1940's. The first detonation was in 1945. It took that long to develop the processes, the concepts, and actually produce fissionable material in sufficient quantity to have the release of energy.

Mr. ROBERTS. About how many men and women would you say were involved in that operation as workers?

Dr. BUGHER. I would hate to trust my memory on figures, but something on the order of 120,000.

Mr. ROBERTS. Do you not think that research is the answer to this cancer problem?

Dr. BUGHER. Yes; most emphatically we do. The things that limit us are partly human, partly manpower. The number of people who are interested and competent to do research in this field is not great. We have to build a corps of research people, and that takes time.

Mr. ROBERTS. It takes money, too; does it not?

Dr. BUGHER. It takes time and it takes money.

Mr. ROBERTS. A lot more money than we are appropriating and is being spent by private agencies today.

Dr. BUGHER. Well, my own feeling is that our greatest bottleneck is not financial but rather the problem of education and the development of young scientific talent to carry on the necessary investigative work. That is what I think is the chief limitation at the present time.

Mr. ROBERTS. But even in the spread of information and in the matter of detection of cancer it is going to require a lot more money than we are spending.

Mr. BUGHER. Oh, yes; indeed.

Mr. ROBERTS. Off the record.

(Discussion off the record.)

Mr. ROBERTS. That is all, Mr. Chairman. Thank you.

The CHAIRMAN. Doctor, you may proceed. May I inquire how many more witnesses there are?

Dr. BUGHER. One more, if you please.

The CHAIRMAN. I thought it was just one.

Dr. BUGHER. The third and the most recent of the research cancer hospitals to be discussed is the new Argonne Cancer Research Hospital in Chicago, dedicated last March, so that it has been in service now for only a few months. It is operated for the commission by the University of Chicago Medical School, but it functions also on behalf of all of the medical schools of the Middle West. We have asked Dr. Hasterlik, who is associated in the direction of this new venture, to give you the major outlines of the program as it is developing there.

The CHAIRMAN. We would be glad to hear from you, Doctor.

STATEMENT OF DR. ROBERT HASTERLIK, ARGONNE CANCER HOSPITAL, CHICAGO, ILL.

Dr. HASTERLIK. Thank you, Mr. Chairman and members. First, Dr. Jacobson, who is ill, asked me to express his regrets that he could not appear in person, and he asked me to present these data to you.

Essentially, our program is divided into three parts. The first is the development of high-energy apparatus for the treatment of cancer. Another portion of it is the evaluation of the efficiency of these various types of machines. And then we are doing fundamental studies on the biology of cancer and the growth factor, and included in this are studies on the effects of radiations on cells and tissues and organisms as a whole.

I was interested to hear Mr. Dolliver ask before whether these were complex machines. Yes. On the staff of our hospital, which has a total scientific staff of 50 individuals, we have 8 physicists and electrical engineers, planning, who also will be needed to keep such equipment in operation. They are very complex.

That brings up a corollary problem. Our institution is not planned as a prototype of what will be available in general to the average physician. It is a research institution. Our apparatus is of a research type. We hope to get answers on what various energy radiations will do to cells, what they will do to tumors as a whole.

Dr. Warren mentioned before that one of the important aspects of treating cancer in the human was the slight difference in sensitivity of the cancer cells in relationship to normal cells. Cancer cells are slightly more sensitive. They die a little more easily than normal tissue cells.

In the past, with the lower energy radiations, this was the means of killing tumors and killing cancer. However, it was not always possible to put a killing dose of radiation into a tumor without doing extensive destruction to the normal tissue around it. Now, how can one change these effects?

Well, one can hope to find chemicals to develop means of making tumor cells more sensitive to radiations in contrast to normal cells, or one can find mechanical means of putting a higher dose of radiation into the tumor directly and not putting it into the normal tissues around it.

As Dr. Brucer mentioned, this can be done by rotating the radiation around the patient; by placing the tumor, as it were, in the center of the circle, so that from all points the radiation passes through the tumor, and very little of the radiation passes into the normal tissues about the tumor.

Well, to carry out these studies we have essentially four machines at present, either complete or in the process of completion. At the

present time we are using a 2 million volt Van de Graaf accelerator. This can be used for rotational therapy, not by rotating the machine but by rotating the patient. This is useful also—and we hope to develop the specific use—for the treatment of skin cancers, because electrons can be brought out of this machine very easily, and electrons of 2 million volts are just the proper energy for penetrating a short distance into the skin. This is just another use of such a machine.

We have almost completed an 1,800 Curie cobalt-therapy unit. This is a unique machine. It is not planned, as Dr. Brucer's machines are planned, for general availability, but is planned to carry out fundamental research on rotation therapy with the energies that are possible from radioactive cobalt.

As an expression of the importance of association of our type of research hospital with the Atomic Energy Commission, I would like to mention that the design of this machine was made possible by the availability of a very high flux of neutrons in one of this country's atomic reactors, making it possible to have this source which is equivalent in radioactivity to about 4 pounds of radium.

As Dr. Warren mentioned, before 1940 there was only 1 pound of radium present in the whole world in refined form.

Moreover, it is possible for us to produce this source in a very tiny shape. The entire source will be only a little more than 1 inch long and about one-fourth of an inch in diameter. This means we can shoot a very small pencil of very energetic radiation into the patient.

Moreover, the Atomic Energy Commission has loaned us 900 pounds of uranium to use as a shield. This uranium is not useful for the other purposes of the Commission, but it is extremely valuable to us, because uranium is a very fine shielding material. If we had to use lead to protect us from this cobalt radiation we would need approximately 4,000 pounds. With uranium we can get adequate shielding with only 900. So mechanically we can have a very small unit, which is very easily rotated around the patient.

We also have in the process of development a highly experimental machine, a 50 million volt linear accelerator. This has been developed for physics research, and now we are adapting such a unit for the treatment of cancer.

I will come back to the reasons for the use of these machines in a moment.

The University of Chicago also uses a 450-million-volt synchrocyclotron. Approximately 14 percent of the operating time of this synchrocyclotron is available to our research group for studies. At the present time means are being devised for getting out a 450-million-volt beam of protons.

A proton is another particle which has a positive charge, and it is also a particle that is very much heavier than an electron.

Now to go back to the reasons for these high-energy machines. I would like to say that this is not done to just build bigger and better machines. The reason for higher energy is that it is possible with these high energies, because of certain physical characteristics, to put a very large dose of radiation within the body and a very small dose into the surface of the body. This means that we will no longer be encumbered by the requirements of doing damage to the surface of the body in treating cancer as we have in the past with low-energy radiations.

Some preliminary studies have been done at the University of California on the biological effectiveness of protons. We hope to extend these studies. The early studies look very promising. It appears that one can put a very large dose of radiation into a deep portion of the body with high-energy protons.

Another aspect of our studies is an extension of the use of hitherto unused radioisotopes in cancer therapy. This aspect of our program is just getting under way, and it parallels the Brookhaven and the Oak Ridge programs.

One interesting use of radioisotopes that is being developed by our group—and it is only possible by the use of some of our very high flux reactors in this country—is the development of a very powerful source of lower energy radiation for the taking of X-ray radiographs. At the present time we are developing a very high specific activity thulium 170 source. This gives off rays that are much like the rays from an ordinary X-ray machine. We hope to develop a unit that is very small, does not depend on electric connections for use, and we hope that it will be possible to develop a practical radiography source. This means many people can do radiography for the detection of cancer under rather adverse conditions.

Yesterday Dr. Mider mentioned the work Dr. Leon Jacobson had been doing and the demonstration he had made that the shielding of the spleen during a radiation protects an animal to an extent from the lethal effects of radiation. This observation is of fundamental importance, not only because of the obvious aspects of protecting individuals from radiation but also because it seems that it may be possible in the future to develop and to demonstrate certain substances present in the blood stream which both protect the bone marrow from damage and will make possible the administration of larger doses of radiation to people in the treatment of cancer, and also because it seems that this not as yet isolated growth factor might in some way be related to the growth of tumors.

Dr. Jacobson's group is carrying on this very interesting approach to the study of cancer and formation of blood.

Another group at our institution is studying the effects of radiation on cells, tissues, and on total organisms. As Dr. Bugher mentioned, in this country there is a rather large group of individuals who were administered radium many years ago as a therapeutic procedure. One of our groups at our hospital is studying the effect of this radium on the bones of these individuals, and the production of tumors in these individuals.

The placing of the Argonne Cancer Research Hospital as part of the University of Chicago Clinic is, I feel, rather fortunate. We have extended some of the studies alluded to yesterday of the relationships of hormones to the growth of cancer. One of our groups at our hospital is studying the relationship of the endocrine glands, specifically the adrenal glands, to the growth of tumor cells, and they are doing this by feeding to the individual safe amounts of tritium, which is radioactive hydrogen and radioactive carbon, labeled precusors of certain hormones, and studying the synthesis of these hormones both in normal and cancerous people. This is a very fundamental study and is being used to elucidate some of the relationships between hormones and growth of cancer.

At this point I would like to mention that this study is made possible because the entire facilities of the Atomic Energy Commission are available to us. These tests, in order to do them safely, require small amounts of these radioactive substances, and we are fortunate in that we can have developed for us very fine and very sensitive detection apparatuses which in general have not been available up to the present, outside the National Laboratories of the Atomic Energy Commission.

Now, we have 58 beds in our hospital, and patients are admitted through our University of Chicago clinics, of which we are a formal part, and are also referred by the 19 medical schools of the Middle West who are affiliated with our hospitals through their relationship to the Argonne National Laboratory. We are accepting only research patients. We hope to evaluate these various radiation factors in these patients.

Another important part of our program which is just getting under way is the training of radiologists from our 19 medical schools. I might mention that others from other parts of the country can certainly come to our institution, but we are concentrating this program in the Middle West at present. This is the training of radiologists in the use of these improved techniques: rotational therapy, the use of radiocobalt therapy, and so forth. We feel it is important for us to disseminate the information on these newer techniques as widely as possible.

I think this sums up in general some of the things we hope to accomplish at our new institution.

The CHAIRMAN. Any questions, gentlemen?

Mr. ROBERTS. Just one question, Mr. Chairman.

The CHAIRMAN. Mr. Roberts.

Mr. ROBERTS. Doctor, is it true that as far as any research program is concerned it could not proceed any faster than the trained manpower and the facilities available to do the job? That would be generally true, would it not?

Dr. HASTERLIK. Yes, I would agree heartily with Dr. Bugher that this is one of the most important parts of our program; stimulating and training scientists in these specific fields.

Mr. ROBERTS. How would you feel about a strong fellowship program to train young scientists?

Dr. HASTERLIK. As a generalization I am very much in favor of it. In what area do you mean, sir? In cancer therapy or in fundamental research in cancer therapy?

Mr. ROBERTS. Well, I would say in fundamental research.

Dr. HASTERLIK. I am very heartily in favor of such a program of training scientists.

Mr. ROBERTS. I believe that is all, Mr. Chairman.

The CHAIRMAN. Any further questions, gentlemen?

I just had 1 or 2 questions to ask Dr. Brucer. What is the approximate size of the cobalt machine?

Dr. BRUCER. The small cobalt machine that we have just developed contains about 350 to 600 curies of cobalt 60. This is the type of cobalt we can readily make available. The size of the machine is about 15 inches in diameter. About that large [indicating].

The machine is supported on the same type of a commercial X-ray stand that is now available for the larger X-ray machines, the 400-kilovolt type. It weighs about 1,250 pounds.

The CHAIRMAN. It has been brought to my attention, Doctor, that you have just recently returned from studying radiation in Europe. Can you tell us about your findings and how we in the United States compare with European research? I think our committee would be very much interested in having your brief statement with reference to it.

Dr. BRUCER. When I refer to this trip with my boss present, I always say we are way behind. Actually we are not completely behind.

The outstanding things I noticed in going through many of the laboratories, especially in England but also in some of the other countries, is the fact that they are making very good use of the two things that they do have available. One is the mechanical engineering that goes into the manufacture of X-ray machines. he other is they do have, through the English reactors, small amounts available of very low intensity cobalt and other isotopes.

In the field of the large sources the X-ray machines, since they cannot get, except through the Canadian reactors, the very large isotope sources, are such that they have specialized on the X-ray machines. One of the things that is outstanding is the fact that they have gone into this moving field, or these extensions of rotational therapy. Actually, I think they are in this field way ahead of us.

Almost all of the research radiotherapists have either developed or are developing or are looking forward to developing some form of a rotational therapy or moving field therapy device.

In the development of the use of very low intensity sources, which they do have available, they have done some very clever things, some of which we are going to copy and some of which I think we can do better than they are doing.

The group at Heidelberg, for example, has taken very small millicurie amounts of cobalt and has made them into seeds, beads, plastic materials, disks, and wafers. None of these are of general use in the treatment of cancer, but each one has a specific use in a very specific type of cancer.

For example, one of the types of seeds that has been developed is only good for treatment of cancer of the maxillary sinus. Another type is only good for treatment of cancer of the bladder.

This is a type of thing we should be doing much more of, and is a type of thing that we will be doing much more of.

The CHAIRMAN. We will now hear from Dr. Charles Doan, dean of the college of medicine of Ohio State University.

STATEMENT OF DR. CHARLES DOAN, DEAN, COLLEGE OF MEDICINE, OHIO STATE UNIVERSITY, COLUMBUS, OHIO

Dr. DOAN. Thank you, Mr. Chairman.

Mr. CROSSER. Doctor, before you undertake your special job, I may say—and I believe I am correct in saying—that you have in Ohio in your own town of Columbus a chapter of the Arthritis and Rheumatism Foundation, have you not?

Dr. DOAN. Yes, sir; that is correct.

Mr. CROSSER. So, as usual, we are leading the way in Ohio.

Dr. DOAN. Yes; we are very happy to support what has been said already this afternoon from our area, as to this work in metabolism and especially rheumatism.

We have a chapter there that is headed up medically by the members of our faculty, who are concerned in that area. We have a very active clinic, a very active division of the department of medicine, devoted to research and the application of treatment to these diseases. Therefore, everything that has been said this afternoon with reference to this specialty we would certainly support, and we would say we are very grateful to have a part in the organized movement and to have at Ohio State University the leadership in our own faculty.

(Discussion off the record.)

The CHAIRMAN. Proceed, Doctor.

Dr. DOAN. Mr. Chairman and gentlemen, I am very appreciative of speaking from the point of view of Ohio State University as a land-grant university, with reference to this attempt to meet the problems of health, especially as they appertain to cancer and other subjects which you are having your hearings about this week and last week.

We have tried to make our contribution with reference to the shortage of doctors which has been mentioned here this afternoon. Since 1945 the State legislature in Ohio has appropriated and we have expended in new facilities some $17½ million. That has trebled our hospital facilities.

We have this fall accepted our fourth class of 150 medical students each, which is just double the number we had prior to World War II, so that we now have in our medical school in the undergraduate years 600 medical students as of this year. We will graduate our first class of 150 next fall.

More than that, we have rejuvenated our nursing school and there have been in the last 2 years 150 each in our freshmen nursery classes. This is leading to the bachelor of arts degree in nursing.

Both from the standpoint of increased nursing supply and from the standpoint of increased physicians the university at Columbus has really taken seriously the challenge of the modern postwar medical era.

When it came to the research activities, these funds have been primarily given for the facilities for basic teaching of medical education, and we have, incidentally, 175 interns in residence; a fifth class, if you please, which is training in our expanded hospital facilities at Ohio State University.

When it came to having this good fuselage, basically to provide more medical and nursing care, the research activities, of course, came in. My first interest personally is research, since I was at the Rockefeller Institute for 5 years in a laboratory right next to Dr. Rhoads when he at that time was beginning his work in research which led to the basic study of cells and cancer. So that the research activities in the college of medicine at the university are the first responsibility of such a faculty, because if we do not have the facts we neither can apply them to the patients who come to us nor can we teach them to our students. Therefore, every member of our faculty is an active investigator.

We asked the Federal Government after this expenditure of funds by the State government for $1½ million for a cancer research unit, through the National Advisory Cancer Council. We also asked for

funds from the National Advisory Heart Council, as they also were concerned with the extension of cardiac research, cardiological research. We were told that with the demands that were made from other worthwhile institutions across the country our allocation would be $300,000 out of the $1½ million we requested. We thanked them very heartily for that and said, "That will be our nest egg."

We went to the legislature which was in session at that time—the Ohio State Legislature—and told them we had to have $300,000 against a program that we felt was of tremendous importance. They said, "We will raise this." And they passed within a month's time this legislation and this fund was granted in the amount of $300,000 for construction: $180,000 for research in cancer from the State legislature for the university for the equipment of this unit for specific research.

Well, in the meantime, the Korean war started and the money just halved when we got our plans in construction value. Therefore, when the contracts—even revised contracts and bids were given, we were $67,000 short of the amount to build the first unit of what we had hoped to be an important research unit, and it was irreducible in its size.

At a State university all the money must be available before the contract can be let—there is no escalator clause which can be used. So, the Kettering Foundation—Mr. C. E. Kettering—being a member of the board of trustees, gave the $67,000 necessary to let this contract.

Therefore, our cancer research unit, dedicated May 9, this year, represents Federal funds, State funds, and private funds, which I think is the way our approach to the answer to these problems should be made these days. There should be at each level responsibilities met from the State, the Federal Government, and from private foundations and private individuals.

We are having an increased number of private gifts donated, market for cancer research at Ohio State University because, I think, we have a good educational institution supported by the State. We have had from the National Institutes of Health in the various areas very important subsidies, both at the teaching level and at the research level. Having been honored with the service as chairman of the anatomological study section, when it was carried on under Dr. Dyer some 7 years ago and for 5 years having served on that from the standpoint of the requests coming in for worthy research projects, I certainly want to testify to the extreme value that it has been to us, both from the standpoint of the receiving end and from the standpoint of the advisory end in those diseases which have to do with the diseases in terms of the allocation of these funds, specifically that you grant. I want to say that I think it is a most magnificent program. This program gives us the kind of unity which is really going to bring answers to these questions.

In terms of cancer, I am extremely optimistic. My own field is leukemia, which is one phase of the cancer problem.

When I began 30 years ago in this field, all of the acute leukemia cases were fatal within 2 to 4 weeks. Everyone I saw in 1930 of the acute leukemia cases were fatal within a very short time. Now, we expect to get remissions lasting from 6 months to 2 years, and it would seem reasonable that if one can prolong life and restore one to a normal

physical state from 2 to 4 weeks or 2 years, why could not it be for 20 years? That is what we ask ourselves.

It would seem that the greatest jump would be to get the first remissions—get the establishment of these abnormal cells back to normal again, and I really believe the studies that are being made at Memorial in New York, where there are these many new synthetic agents being made chemically, and we in our own laboratory have synthesized over 250 chemicals with radioactive isotopes with the aid of our own cyclotron and of course the work that is going on at Oak Ridge, we have some 20 of those that have in our preliminary studies with animal tumors given promise enough for trial in the human. So, we are going on with clinical studies very shortly with those in order to approach it from the metabolic point of view, from the chemical point of view and from the isotope point of view—the three main roads down which research is moving with an increase in tempo, I believe that not only will we have these acute leukemias back within 2 years, but I hope we will be able to see them indefinitely remitted. It is no worse now to have a chronic lekemia than a mild case of diabetes or arthritis. We can control leukemia—chronic leukemia—in 90 percent of the cases and they usually die of something else.

Mr. DOLLIVER. What are the measures which you take in leukemia?

Dr. DOAN. Do you mean the acute? There is a different approach to each, and as to whether it is a metabolic or the cancerous condition. We have studied that matter very intensively. In the 1,600 consecutive cases of leukemia that I have personally seen within the last 20 years, we think only 400 of those, or 25 percent, are true malignancies in terms of a malignant disease. The others are metabolic, or they come under the category of pernicious anemia, which was thought to be a cancer to start with. It is a deficiency disease, and many of the chronic leukemias have the same characteristics for white cells, and yet we know as much about what it takes to mature a young white cell to maturity as we know about red cells. With vitamin B_{12} and folic acid we will have the answer to chronic leukemia. We do not have to study and solve the problem of malignant diseases to cure the so-called leukemia. So that is the approach there.

If we get a mild overproduction of cells, as in chronic leukemia, we have to use a supressive or destructive agent if we cannot control it by the metabolic activities. We are looking for an enzymatic material much like insulin is for diabetes, and if we get that we should be well on our way. We believe the enzymes that are necessary to break down proteins for body synthesis, which gradually decrease in their productivity just as the material necessary to prepare red muscle meat for red-cell generation needs to be supplied. When we have that, then these cells will mature, and we are on the road to that with the aminol acids and the various enzymes that break down proteins to aminol acids and fatty acids to get a better understanding of what is necessary for these cells.

If that does not help, then we have to use mild suppressive agents such as deep X-ray, if it is in small doses, of radioactive phosphorus, P_{32}, which is very effective in very chronic types of conditions. We have cured chronic leukemia as long as 20 years with mild radiation or radioactive phosphorus.

There are other chemicals which we can use. One of the other mild suppressives which will differentially suppress the abnormality of the white cells without destroying other cells—and that is the criteria of an agent that will specifically depress a cell that has a little more stimulus than a cell which does not, is the folic acid. In the acute leukemia, of course, as you have already heard, the folic-acid antagonists are very effective in the acute sarcoma.

The new purine which which was shared with us in the early days in the work which has been done by Dr. Rhoads has added markedly to our armament in the acute leukemia cases, and a still further new unit has been made available within the last 6 weeks. So with cortisone, with ACTH, with folic acid, with nitrogen mustard, and with these new agents, any one of which may be specific for a short time for an individual but not in the same individual from time to time, we can prolong the life and usefulness of many of these patients, both children and adults, for matters of months or of a few years.

It simply means, from the standpoint of trying to say so, that the progress made in this field, I think, is as great today and is as promising as the antibiotics in the field of infectious diseases. I feel just that way, and I have been right close to it for 30 years.

The CHAIRMAN. Doctor, your presence has indeed been very encouraging. You speak with a note of optimism that we are glad to hear, because, after all, while these studies are interesting from the standpoint of detailed information that is provided, after all, what we are seeking is something that will alleviate the condition so far as the public is concerned.

When you speak as you do here today, it is very encouraging, because it is really observable that you have optimism which is an optimism and belief that is not based on pollyanna optimism, but optimism based upon studies which you have made in long contact with the problem. You are able to look ahead and speak in the optimistic way that you do.

The presentation which you have made suggests that chemistry and physics and biology and all the biosciences are all assuming partnership with the doctors in the modern attack on disease. I think it is very fortunate that in your activities you can have a combination of these working together, so to speak, which promise the results that enable you to be optimistic.

We certainly are indeed indebted to you for your appearance here today. What you have stated adds very materially to what we have heard on Friday and Saturday of last week. It gives the committee additional encouragement to press on when men of your standing come here voluntarily as you have and give us the benefit of the information that you have gained through years of study, and years of activity. At times undoubtedly you have been discouraged and at other times you have been encouraged, all of which goes to make up the experience that brings you here today and gives us your optimistic view which you have expressed. We are indeed grateful to you.

Dr. DOAN. May I just add that even as we have been cooperating with other agencies in funds, so every unit of research—each research group across this country is as close as the telephone, and time and again we have had from our laboratory communications to others

and they to us, and the great thing in this free country of ours is that not only is there an interchange of financial support, but the information which one group gets on the Pacific coast, that group on the east coast also receives. It is just as quickly flashed as was the football game on Saturday from California to us and as the baseball game which is now going on in New York to us. So, we are in an age when every combined effort, you and ourselves combined, are going to solve this problem, I am sure, in the best interest of humanity. Thank you.

The CHAIRMAN. We thank you that you included this committee in what you hope will be the ultimate results.

Dr. DOAN. I certainly do.

Mr. HESELTON. Doctor, several times there have been references to isotopes and you made reference to it. I am sorry you did not explain what that is. I would like to have a brief description of what it is.

Dr. DOAN. Radioactive istopes are produced in the uranium pile or in the cyclotron. In 1939 or 1940 Ernest Laurence in California established a large cyclotron that was able to crack the atom and produce certain elements that had radioactivity. Following this, John Laurence, his brother, went from Yale with a man trained in my department, to California and gave the very first product of the new large cyclotron there to a human patient with radioactive phosphorus. That is an element that during the first 14 days of its creation loses one-half of its radioactivity, whereas radium may have years or millions of years of activity.

This is a temporary activity that is given for radioactivity and phosphorus is metabolized by bones, and in leukemia the overgrowth of cells is largely in the bone marrow. Therefore, this phosphorus, just as it metabolized with calcium in making the skeleton, is deposited in the skeleton and bombards like a machinegun those cells near it which are growing at an abnormal pace. Well, by adjusting the dosage of the ammunition, like putting a brake band on and putting a brake just so tight, will just slow that process down so that the person who is being overburdened by too active a process, will be brought down to normal, we have to reline the brake bands with a little more of this radioactive phosphorus.

Then, came cobalt-60, which is a radioactive cobalt, which has a 5-year life and can be used much less as the radium, but can be substituted as a gamma-ray treatment for use in cancer that cannot be removed. Then, we come to radioactive gold, which is the least tarnishing of metals—one one that is least radioactive. Now, we can make gold which has two and one-half days' life of radioactivity in nylon thread and when one gets a tumor that cannot be removed surgically because it involves a main blood vessel, one can sew into that tissue these little bits of radioactive gold with an exact dosage. So, if we are wise enough to know just what the dose for that given unit is, it is like the electric chair. You try to get just the cells that are still cancerous out just like we do an abnormal member of society—get him out before he cuts other people out. That has been developed to a high stage, both cobalt and gold isotopes. This is material that is inert material which is placed in the pile at Oak Ridge, brought to our laboratories then by air and are produced there and used. We have had over 100 patients that we have used this supplement of

radioactive gold seed, which is a real advance in adding to surgery.

We all admit if you can cut out a cancer, that is gone, but if you cannot get to it, now we have a way of getting right to the seed—right to the place where it is. If you leave the gold in, it is all right. If you can have gold in your mouth, we can have gold in your tissue. It does not cause a reaction, or you can put in the threads and pull them out after a week or two. That is a development which adds to the facilities of the surgeon in handling growths, which is what we are after.

There are two methods of approach: What is the cause of it? Let us take the question of cancer. That is one method and that is the basic research. What is it that gets wrong with cells that make them behave as do some people in society? Well, we are trying to find that out. Once you get a cell of that kind in the body or a group of cells, how can we get rid of them without the knife or with these radioactive isotopes? So, the radioactive isotopes are elements that have been made radioactive with fairly regular lengths of life. Then, we have the gamma ray and that is what we want for cancer. That can be brought in close contact with the enemy and those cells threatening to take over. They represent a tremendous asset to the surgeon and make it possible for him to go one step farther in prolonging the useful life of an individual. When you have a tumor where there is a main vessel where he cannot go farther without disturbing something else, then you sew these in.

Now, it is possible by seeing the type of cell under the microscope and knowing what its sensity is, to figure a dose which is pretty accurate and getting increasingly more accurate, and being able to place it within a pinpoint of where it should be, knowing the susceptibility and cell type with which you are dealing, by seeing it and then bringing these things to bear, we will have a tremendous prolonging of life in a lot of people where we do not actually eliminate surgically the cancer.

The CHAIRMAN. Thank you, Doctor.

Are there any further questions, gentlemen?

Doctor, again thank you on behalf of the committee for your willingness to come here, and having offered to us as a witness your testimony and experience. It has been very beneficial to us in the work we are striving to do. We feel greatly indebted to you.

Dr. DOAN. Thank you for the privilege, Mr. Chairman.

Mr. PRIEST. I would like to concur with the chairman, Doctor, and also express an additional appreciation for the leadership which I think you have given at Ohio State in developing a balanced program between State and the Federal Government.

Dr. DOAN. Good.

Mr. PRIEST. I think you have been a leader in that field and have done a terrifically important job that needs to be done, and I want to express that appreciation.

Dr. DOAN. Thank you. We are very proud of it.

The CHAIRMAN. Any further questions, gentlemen?

I do not know how to express, as we bring to a close these hearings on cancer, the great degree of gratification that comes to us to realize the progress that is being made by means of research. It certainly gives promise for the future in a way that is most encouraging. It is

particularly gratifying to see the extent of the work on this disease, and no doubt it will prove equally true of other diseases we will study, when we realize the extent of time and effort that is being put forth by individuals who cannot be actuated by any other motive than to do something that will prove helpful to their fellow man.

Certainly I have not been able to observe, nor do I expect to be able to see, that the monetary returns which will come to the individuals who are doing this work are in any way a compensation for the benefits that their work will give to humanity in general. Therefore, I have great respect, and I wish it were possible for me to express in better words our appreciation to you who have appeared here this morning for the splendid work which you are doing and directing in these different activities in which we are engaged.

I can only say that the future has promise, great promise, as you proceed with your work. While it may be tedious and a day in itself will not reveal much progress, yet as you do look back over what you have been able to accomplish and have that as a basis for what you will do in the future I think you can take great courage and be inspired to carry on that we will come to those things that will prove worthwhile and will be for the benefit of humanity in general.

We thank you, Doctor. You have headed up this panel in a very fine way, and those who have been with you have assisted in a way that cannot help but be very productive in the work of this committee and our objective, which we hope to obtain.

Dr. BUGHER. Thank you, sir.

The CHAIRMAN. We are adjourned.

(The following tables were submitted for the record:)

General funds raised and medical research funds allocated by voluntary health agencies interested in specific diseases

	1944		1945		1946		1947		1948	
	Total funds	Medical research funds	Total funds	Medical research funds	Total funds	Medical research funds	Total funds	Medical research funds	Total funds	Medical research funds
American Cancer Society, 47 Beaver St., New York, N. Y.	$832, 862 [1] 212, 500	None	$4, 292, 492 [1] 1, 587, 194	$960, 000	$10,150,000 [1] 4, 060, 000	$2, 052, 847	$12,182,470 [1] 4, 857, 246	$3, 159, 198	$13,221,069 5, 294, 496	$3, 300, 000
Damon Runyon Memorial Fund, Hotel Astor, New York, N. Y.							1, 387, 470	850, 000	872, 416	702, 000
American Foundation for the Blind, 15 West 16th St., New York, N. Y.	[2] 412, 769	[2] $49, 996	[2] 464, 000	[2] 34, 651	[2] 306, 000	[2] 17, 000	[2] 575, 000	[2] 42, 000	[2] 558, 000	[2] 48, 000
National Council to Combat Blindness, 1186 Broadway, New York, N. Y.									19, 880	8, 394
National Society for the Prevention of Blindness, 1790 Broadway, New York, N. Y.	185, 919	(4)	211, 885	(4)	224, 641	(4)	239, 032	14, 000	228, 326	33, 251
American Hearing Society, 817 14th St. NW., Washington, D. C.	36, 341	None	30, 151	None	58, 784	None	68, 675	None	71, 355	None
American Heart Association, 1775 Broadway, New York, N. Y.	41, 101	None	39, 052	None	85, 142	[3] 12, 220	133, 699	40, 267	2, 502, 176	699, 932
American Social Hygiene Association, 1790 Broadway, New York, N. Y. (national)	345, 522	None	371, 051	None	299, 316	None	380, 101	None	[4] 1, 631, 598	[17] 22, 682
Arthritis and Rheumatism Foundation, 23 West 45th St., New York, N. Y.[5]									341, 608	None
Muscular Dystrophy Associations of America, 21 East 40th St., New York, N. Y.[18]									[5] 222, 606	(5)
National Association for Mental Health (ex-National Com. for Mental Hygiene), 1790 Broadway, New York, N. Y. (national) [11]	149, 712	48, 901	212, 554	39, 719	203, 088	49, 535	202, 170	51, 134	217, 624	45, 237
National Epilepsy League (ex-National Association to Control Epilepsy), 130 North Wells, Chicago, Ill.[12]									33, 373	8, 482
National Foundation for Infantile Paralysis (National and States), 120 Broadway, New York, N. Y.	[10] 713, 131 5, 452, 594	1, 238, 254	[16] 589, 875 [1] 8, 377, 013	406, 427	[15] 982, 151 [1] 8, 720, 565	1, 858, 827	[17] 987, 801 [1] 9, 748, 752	1, 779, 577	[18] 669, 299 [1] 9, 784, 864	[13] 2, 479, 617
National Multiple Sclerosis Society, 270 Park Ave., New York, N. Y.					30, 983	None	108, 090	12, 628	147, 967	62, 368
National Society for Crippled Children and Adults, 11 South LaSalle St., Chicago, Ill.	[1] 681, 993 [1] 139, 605	None	[2] 718, 879 [1] 225, 667	None	[3] 467, 074 [1] 287, 767	None	[4] 431, 009 [1] 367, 775	None	[5] 410, 324 [1] 451, 952	None
National Tuberculosis Association (National and States), 1790 Broadway, New York, N. Y.	[14] 966, 224 [1] 748, 211	64, 692	[15] 500, 000 [1] 775, 000	68, 000	[16] 250, 000 [1] 812, 500	90, 000	[17] 075, 608 [1] 853, 780	207, 220	[18] 665, 524 [1] 933, 276	(4)
Planned Parenthood Federation of America (national, city, county areas in metropolitan New York), 501 Madison Ave., New York, N. Y.	[14] 170, 697	None	[14] 176, 343	None	[14] 165, 056	None	[1] 733, 271 [1] 209, 665	20, 000 [1] [13] 18, 500	698, 738 [1] 182, 780	54, 111 [1] 35, 926
United Cerebral Palsy (ex-Cerebral Palsy Society of New York City), 80 West 57th St., New York, N. Y.[18]									[19] 7, 054 52, 461	9, 250
Total	29, 536, 271	1, 401, 843	40, 606, 282	1, 508, 797	47, 222, 235	4, 080, 429	55, 504, 396	6, 176, 024	59, 515 62, 031, 166	9, 250 7, 450, 942

Footnotes at end of table, p. 431.

General funds raised and medical research funds allocated by voluntary health agencies interested in specific diseases—Continued

	1949		1950		1951		1952	
	Total funds	Medical research funds	Total funds	Medical research funds	Total funds	Medical research funds	Total funds	Medical research funds
American Cancer Society, 47 Beaver St., New York, N. Y.	$13, 596, 661	$3, 399, 165	$13, 933, 638	[17] $3, 842, 982	$14, 974, 514	$4, 008, 757	$16, 438, 184	$4, 572, 664
[1] 5, 443, 310					[1] 3, 743, 628		[1] 4, 109, 546
Damon Runyon Memorial Fund, Hotel Astor, New York, N. Y.	584, 754	[18] 839, 524	1, 472, 092	1, 006, 000	[19] 1, 354, 138	1, 228, 774	1, 110, 267	[18] 1, 375, 159
American Foundation for the Blind, 15 West 16th St., New York, N. Y.	[2] [19] 558, 000	[2] 133, 541	445, 802	[2] 30, 766	528, 581	[2] 285, 089	470, 423	[2] 287, 131
National Council to Combat Blindness, 1186 Broadway, New York, N. Y.	26, 616	11, 344	42, 036	20, 872	46, 179	26, 190	59, 347	33, 809
National Society for the Prevention of Blindness, 1790 Broadway, New York, N. Y.	215, 072	27, 278	214, 941	26, 074	217, 524	34, 219	217, 278	39, 908
American Hearing Society, 817 14th St. NW., Washington, D. C.	74, 575	None	84, 575	None	75, 863	None	83, 742	None
American Heart Association, 1775 Broadway, New York, N. Y.	2, 655, 777	899, 985	4, 104, 485	1, 212, 926	5, 551, 267	1, 595, 657	6, 582, 133	1, 991, 981
[1] 748, 177	[1] 386, 385	[1] 1, 046, 040	[1] 502, 326	[1] 1, 373, 603	[1] [20] 605, 157		[1] [21] 791, 981
American Social Hygiene Association, 1790 Broadway, New York, N. Y. (national)	482, 235	None	361, 260	None	411, 658	None	433, 425	None
Arthritis and Rheumatism Foundation, 23 West 45th St., New York, N. Y.[3]	769, 705	99, 661	1, 054, 082	225, 630	1, 023, 319	290, 734	1, 426, 000	313, 655
			[1] 70, 009	[1] 60, 017				[1] 116, 000
Muscular Dystrophy Associations of America, 21 East 40th St., New York, N. Y.[10]			52, 150	19, 000	191, 000	98, 000	668, 250	317, 000
National Association for Mental Health (ex-National Com. for Mental Hygiene), 1790 Broadway, New York, N. Y. (national) [11]	276, 278	56, 656	[11] 194, 369	42, 426	600, 863	64, 540	592, 463	71, 725
National Epilepsy League (ex-National Association to Control Epilepsy), 130 North Wells, Chicago, Ill.[12]	([22])	([22])	[9] 18, 163	None	([4])	([4])	([4])	([4])
National Foundation for Infantile Paralysis (National and States), 120 Broadway, New York, N. Y.	22, 630, 977	1, 734, 065	27, 321, 000	2, 300, 658	29, 343, 000	2, 581, 824	41, 410, 000	3, 316, 853
	[1] 11, 241, 415		[1] 13, 427, 327					
National Multiple Sclerosis Society, 270 Park Ave., New York, N. Y.	187, 451	118, 871	181, 908	76, 272	190, 321	119, 531	[1] 248, 033	100, 360
National Society for Crippled Children and Adults, 11 South LaSalle St., Chicago, Ill	5, 781, 000	100, 000	5, 855, 487	115, 475	6, 100, 330	77, 416	6, 721, 938	11, 957
	[1] 479, 823	[1] 40, 000	[1] 584, 062	[1] 40, 475	[1] 623, 812	[1] 37, 984		
National Tuberculosis Association (National and States), 1790 Broadway, New York, N. Y.	20, 226, 794	[1] [23] 116, 693	20, 960, 000	[1] 209, 600	21, 717, 953	[1] 308, 130	23, 238, 148	[1] 277, 172
	[1] 1, 011, 340		[1] 1, 257, 600		[1] 1, 303, 077		[1] 1, 394, 289	
Planned Parenthood Federation of America (National, city, county areas in metropolitan New York), 501 Madison Ave., New York, N. Y.	685, 932	[24] 37, 761	691, 797	12, 388	705, 011	13, 040	735, 468	[24] 27, 794
United Cerebral Palsy (ex-Cerebral Palsy Society of New York City), 50 West 57th St., New York, N. Y.[25]	[20] 90, 065	[20] 19, 700	1, 022, 000	800	[23] 2, 133, 000	107, 875	4, 650, 000	128, 466
							[1] [23] 1, 691, 839	
Total	68, 919, 097	7, 594, 244	78, 052, 034	9, 143, 822	85, 265, 990	10, 839, 776	105, 085, 099	12, 865, 634

[1] National office.
[2] Including gifts to endowment.
[3] Research for special appliances, training, etc.
[4] Not available.
[5] Part of this from a fund for research in rheumatic fever.
[6] Approximately $1,500,000 received from Truth and Consequences program, and by national office.
[7] As fiscal year was changed in 1949 to end June 30 rather than Dec. 30 as in past years, these figures are for first 6 months only.
[8] Dec. 31, 1948, figures, first campaign started in November 1948.
[9] No allocation to Dec. 31, 1948.
[10] Organized April 1950. Figures for April 1950 through Dec. 31, 1950.
[11] Organizations merged, figures only for Jan. 1, 1950-Sept. 13, 1950.
[12] Organized 1950.
[13] Dec. 31, 1948, figures.
[14] National office and New York, N. Y.
[15] Includes $8,000 gift transmitted directly to National Research Council.
[16] Founded in late 1948.
[17] $3,483,410 allocated to research by national headquarters (25 percent of gross contributions), 93,750 additional amount allocated from general fund to research. $265,822 budgeted for research by divisions.
[18] Part of this sum was raised during previous years.
[19] Total funds raised 1947-51: $5,670,869; total medical research funds 1947-51: $4,626,298. The difference of $1,044,571 represents allocations for research fellowships.
[20] This amount allocated to medical research by the American Heart Association and its affiliates.
[21] An estimated $1,200,000 devoted by the affiliates to research; an actual $791,981 allocated by national office to research.
[22] Not functioning.
[23] Amount spent by State and local associations not available.
[24] $14,818 spent for medical research grants-in-aid and $12,976 spent in developing and expanding medical-research program.
[25] Figures for 1951 are fiscal year figures, while figures for 1952 are calendar year figures.
[26] Initial national campaign not sufficiently concluded to provide figures.

NOTE.—Many of the organizations listed on this chart use the major part of their total funds raised each year for patient care, clinics, medical education, social research, special appliances, rehabilitation, etc.

In columns where a total figure is given with a national office figure in (!) below it it means that the national office retained only that much of the total figure and apportioned the remainder out amongst its field offices, or designated part of the remainder to research.

The figures given on this chart are for the year designated; they are not accumulative from year to year. In all cases, the medical research funds are part of the total funds, i. e., the total funds are inclusive of medical research funds.

The American Diabetes Association, 11 West 42d St., New York, N. Y., carries on no public campaign for contributions and does not consider itself a voluntary health agency. It is therefore not included in this chart. In 1948 their total funds were $91,366, of which $300 went to medical research; in 1949, total funds $77,204 with no medical research funds; in 1950, total funds were $42,249 with $1,953 going to medical research; and in 1951, total funds were $101,469 with $2,043 going to medical research.

Disability	Estimated annual deaths 1952 [1]	Estimated disabilities	1952	
			Estimated research funds spent per death by the listed voluntary health organizations	Estimated research funds spent per estimated disability by the listed voluntary health organizations
Cancer and other tumors	224,130	1,100,000 [2]	$26.54	$5.41
Blindness		300,000 [3]		1.20
Hearing impairment (in some degree)		15,000,000 [4]		None
Diseases of heart and circulation	771,020	9,590,000 (in some degree) [7]	2.58	.21
Syphilis	5,700	2,100,000 (in some degree) [6]	None	None
Gonorrhea	[5] 71	245,220	None	None
Arthritis and rheumatism (in some degree).		10,000,000 [7]		.03
Muscular dystrophy		100,000 [8]		3.17
Mental disorders (in some degree)		8,500,000 [9]		.008
Epilepsy		800,000 [10]		None
Infantile paralysis	3,300	50,280 cases [11]	1,005.11	65.97
Multiple sclerosis		250,000–300,000 [12]		.33
Cripples (includes cerebral palsy, polio, arthritis, muscular dystrophy, multiple sclerosis, etc.).		750,000 children, 4,000,000 adults.[10]		.003
Tuberculosis	25,080	400,000 active, 800,000 inactive.[12]	11.03	.23
Maternal deaths associated with childbirth.	2,530		10.99	
Cerebral palsy		550,000 [14]		.23

[1] Figures from National Office of Vital Statistics.
[2] National Health Survey Bulletin No. 6, U. S. Public Health Service, 1938, adjusted to 1950 population.
[3] Letter, June 19, 1953, from Mildred Welsenfeld, executive director, National Council to Combat Blindness.
[4] U. S. Public Health Service Publication No. 1, Conservation of Hearing, issued by the Federal Security Agency, 1950.
[5] 1948.
[6] VD Fact Sheet No. 9, Venereal Disease Division, U. S. Public Health Service, December 1952.
[7] Per phone convervation, July 17, 1953, with Paula Fradkin, Arthritis and Rheumatism Foundation.
[8] Per Michael E. Freeland, Dec. 27, 1951, executive director, Muscular Dystrophy Associations of America. No figures for number of deaths from muscular dystrophy as death is caused largely by respiratory ailments such as pneumonia.
[9] Group for the Advancement of Psychiatry, Report No. 7, March 1949.
[10] Letter, July 16, 1953, from R. L. Kahn, administrative assistant to executive director, National Association for Crippled Children and Adults.
[11] Social Legislation Information Service Bulletin No. 89, Nov. 15, 1952.
[12] Estimate of Sylvia Lawry, executive director, National Multiple Sclerosis Society, June 17, 1953, and Newsweek, Jan. 14, 1952.
[13] Letter, June 19, 1953, from Mary Dempsey, statistician, National Tuberculosis Association.
[14] Letter, June 23, 1953, from Karl K. Van Meter, executive director, United Cerebral Palsy.

(Thereupon, at 1:27 p. m., Saturday, October 3, 1953, an adjournment was taken to 10 a. m., Monday, October 5, 1953.)

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